Mysteries of the Inner Earth

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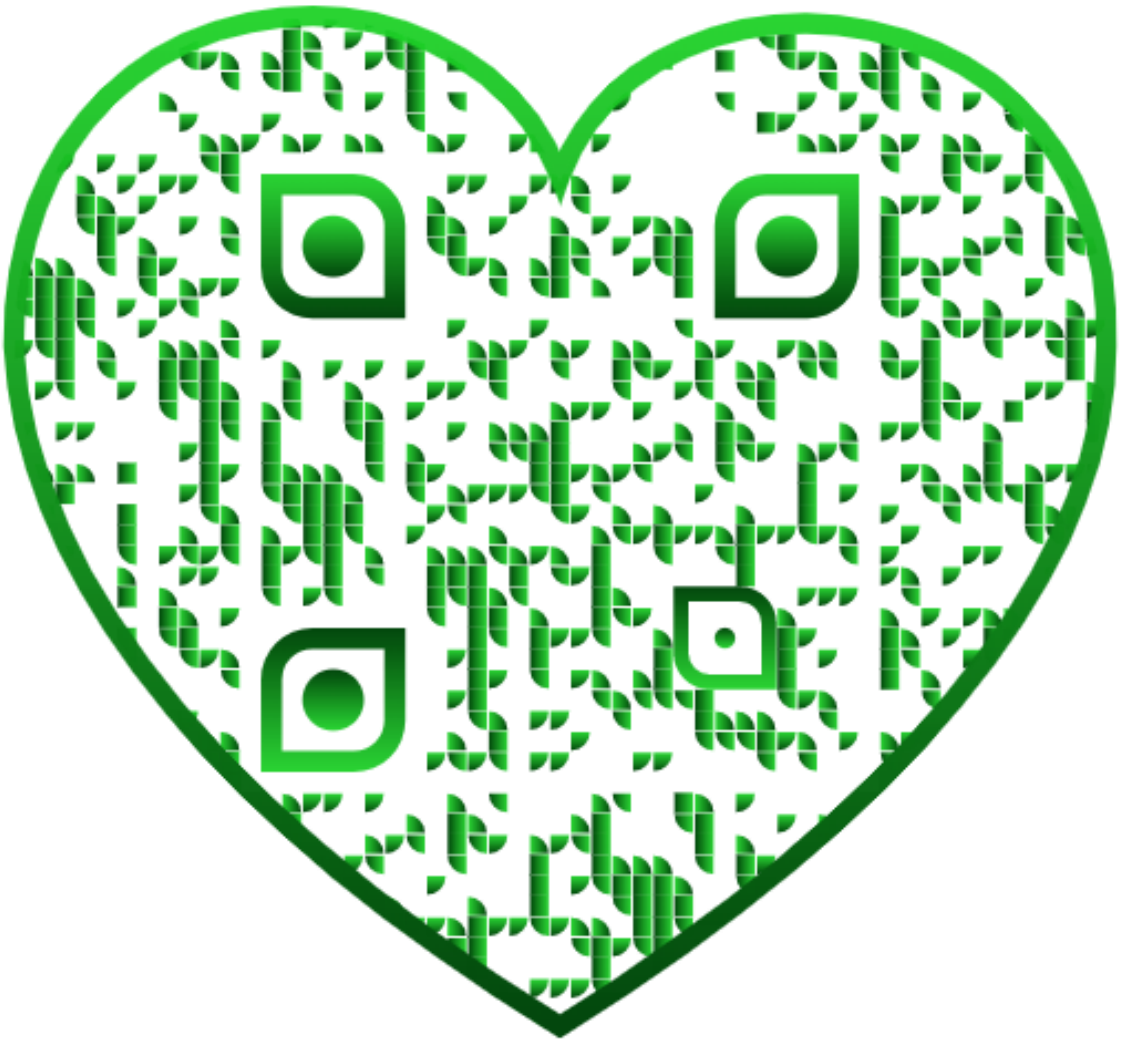

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Part 1: The Solid Earth Hypothesis

1. The standard earth model

Our direct knowledge of the earth's interior is minuscule. The earth has a radius of about 6370 km, but the deepest scientific borehole ever drilled is only 12 km. To put this in perspective: if the earth were reduced to a tabletop globe 50 centimetres (20 inches) in diameter, the portion accessible to direct observation through the deepest borehole would be the equivalent of a very thin skin less than 1 millimetre (0.04 inch) thick. In other words, scientists have barely scratched the surface of our globe.

Nevertheless, over the past 100 years or so, geoscientists have put together a detailed picture of the earth's interior based largely on *indirect* evidence -- mainly the behaviour of seismic waves that travel through the earth [1]. The earth's interior is believed to consist of several concentric spheres: an outer solid crust, averaging 7 km thick beneath oceans and 35 km beneath continents; a mainly solid mantle extending to a depth of 2900 km; an outer core of liquid iron extending to a depth of 5150 km; and an inner core of solid iron, with a radius of about 1220 km.

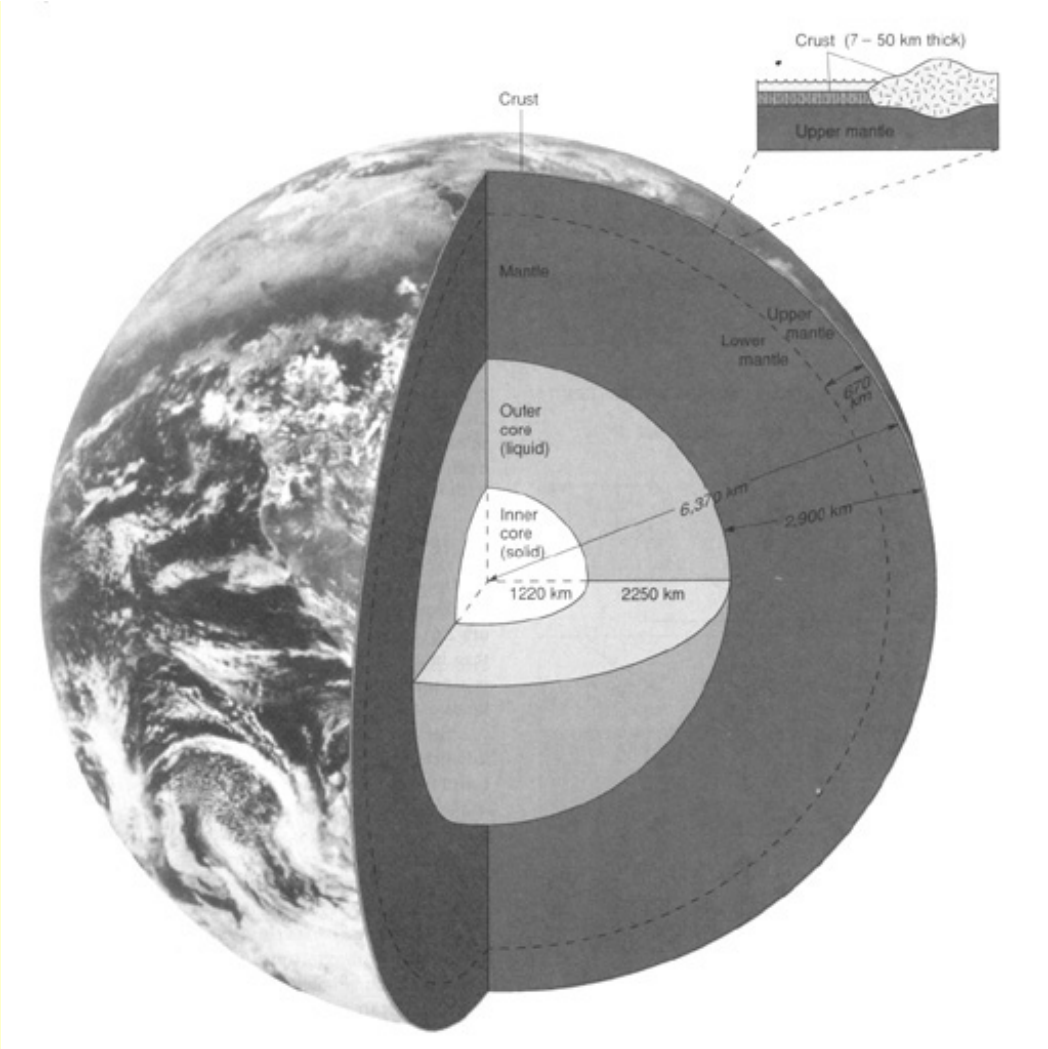

Figure. The standard model of the earth's interior [2].

Whenever an earthquake occurs, seismic waves spread out from the focus in all directions. Three types of waves are distinguished: surface waves, body waves, and free oscillations (vibrations of the entire planet). Instead of travelling in straight lines, body waves are reflected and refracted (bent), depending on the density, pressure, and elasticity of the different layers of rock through which they pass. On the basis of the time taken by different types of waves from specific earthquakes to reach different parts of the earth's surface, seismologists try to work out the precise path the waves have taken, the changes in velocity they have undergone at different depths, and the density and composition of the earth at different depths. Nowadays this is done with the help of supercomputers.

Raypaths are immensely complex; waves may undergo multiple reflections and refractions, and their paths are further complicated by the fact that lateral heterogeneity exists at every depth in the earth. This is directly indicated by the scatter in seismic-wave arrival times at all distances from the source. Seismic tomography, which seeks to image the three-dimensional structure of the earth, provides indirect evidence of lateral variations of up to 10% in seismic velocity through the crust and mantle.

Scientists cannot even begin to interpret the hundreds of thousands of seismic records without making certain basic assumptions about the earth's interior. The main

assumptions are that the earth's interior consists entirely of solid or liquid physical matter, and that temperature, pressure, and density increase with depth. These assumptions are generally believed to be self-evident.

At several depths in the earth, there appear to be discontinuities where the velocity of seismic waves changes abruptly. Such discontinuities are often transition zones rather than sharp boundaries, and vary in depth from place to place. The dominant boundary is that between the mantle and the core. Next in order of magnitude are the crust-mantle boundary (Mohorovicic discontinuity or Moho), the inner core-outer core boundary, and the mid-mantle discontinuities at depths of 400 and 670 km. The earth's core was 'discovered' in 1906, and its depth (about 2900 km) was determined by 1914. The Moho was 'discovered' in 1909, the inner core in 1936, and the 400- and 670-km discontinuities in the 1960s.

The thickness of the crust varies from 20 to 70 km beneath continents and from 5 to 15 km beneath oceans. As well as differing greatly in thickness, continental and oceanic crusts are said to have very different compositions: continental crust consists chiefly of granitic rock capped by sedimentary rocks, while ocean crust is believed to be composed largely of basalt and gabbro. At the crust-mantle boundary or Moho, seismic-wave velocities change abruptly, but there is no consensus on exactly why. No drillhole has yet penetrated to the Moho anywhere. The Moho varies considerably in depth, sometimes several Mohos are stacked up, and in places there is no Moho at all. Sometimes it is flat, continuous, and oblivious to faults, while in other areas it is strongly influenced by overlying geological structures and jumps from one depth to another [3].

At the two main discontinuities in the mantle, rocks are widely believed to undergo pressure transformations to denser phases. The 670-km discontinuity marks the boundary between the upper and lower mantle; seismic waves increase suddenly in speed at this depth, and earthquakes essentially cease. The mantle is thought to be composed of the dense, ultrabasic (ultramafic) rock peridotite. This is because lava sometimes contains fragments of peridotite and mountain-building processes sometimes bring up wedges of peridotite, and in both cases this rock is assumed to come from the mantle. V. Sánchez Cela disagrees and argues that many geological and geophysical phenomena can be better explained if the upper mantle is far more sialic (granitic) than currently believed [4].

The outer core is said to consist mainly of liquid iron, and the inner core of solid iron. The reasoning behind this is as follows. There are two main types of seismic body waves: P waves (compressional or longitudinal waves) and S waves (transverse or shear waves). P waves can travel through solids, liquids, and gases, while S waves can only travel through solids. Seismic waves do not reach certain areas on the opposite side of the earth from a large earthquake. P waves spread out until, at 103° of arc (11,500 km) from the epicentre, they almost entirely disappear from seismograms. At more than 142° (15,500 km) from the epicentre, they reappear. The region in between is called the P-wave shadow zone. P waves are said to be missing in the shadow zone because they are refracted by the core.

The S-wave shadow zone is larger than the P-wave shadow zones; direct S waves

are not recorded in the entire region more than 103° away from the epicentre. It therefore seems that S waves do not travel through the core at all, and this is interpreted to mean that it is liquid, or at least acts like a liquid. The way P waves are refracted in the core is believed to indicate that there is a solid inner core. Although most of the earth's iron is supposed to be concentrated in the core, it is interesting to note that in the outer zones of the earth, iron levels *decrease with depth*.

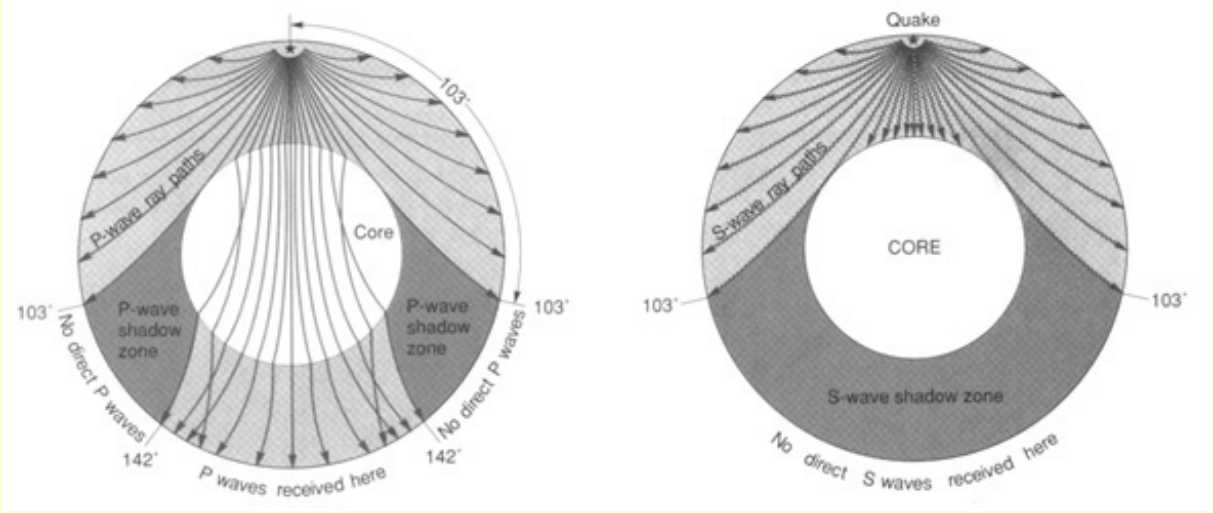

Figure. P-wave and S-wave shadow zones [5].

Seismologists sometimes draw contradictory conclusions from the same seismic data. For instance, two groups of geophysicists produced completely different pictures of the core-mantle boundary, where there are believed to be 'mountains' and 'valleys' as high or deep as 10 km. The two groups used virtually the same data but used different equations to process them [6]. Seismologists also disagree on the rate of rotation of the inner core: some say it is rotating faster than the rest of the planet, others that it is rotating more slowly, and yet others that it rotates at the same speed [7]!

It is becoming increasingly evident that the earth model presented by the reigning theory of plate tectonics is seriously flawed [8]. The rigid lithosphere, comprising the crust and uppermost mantle, is said to be fractured into several 'plates' of varying sizes, which move over a relatively plastic layer of partly molten rock known as the asthenosphere (or low-velocity zone). The lithosphere is said to average about 70 km thick beneath oceans and to be 100 to 250 km thick beneath continents. A powerful challenge to this model is posed by seismic tomography, which shows that the oldest parts of the continents have deep roots extending to depths of 400 to 600 km, and that the asthenosphere is essentially absent beneath them. Seismic research shows that even under the oceans there is no continuous asthenosphere, only disconnected asthenospheric lenses.

The more we learn about the crust and uppermost mantle, the more the models presented in geological textbooks are exposed as simplistic and unrealistic. The outermost layers of the earth have a highly complex, irregular, inhomogeneous structure; they are divided by faults into a mosaic of separate, jostling blocks of

different shapes and sizes, generally a few hundred kilometres across, and of varying internal structure and strength. This fact, in conjunction with the existence of deep continental roots and the absence of a global asthenosphere, means that the notion of huge rigid plates moving thousands of kilometres across the earth is simply untenable. Continents are about as mobile as a brick in a wall!

The plate-tectonic hypothesis that the present oceans have formed by seafloor spreading since the early Mesozoic (within the last 200 million years) is also becoming increasingly implausible. Numerous far older continental rocks have been discovered in the oceans, along with 'anomalous' crustal types intermediate between standard 'continental' and 'oceanic' crust (e.g. plateaus, ridges, and rises), and the evidence for large (now submerged) continental landmasses in the present oceans continues to mount.

2. Deep drilling springs surprises

How much faith can be put in the theories concerning the composition and density of rocks at different depths? The only place where the accuracy of scientific models can be tested directly is in the uppermost few kilometres of the crust. Although oil companies have drilled as deep as 8 km on land, they drill in sedimentary basins. The igneous and metamorphic basement, which averages 40 km thick and makes up most of the continental crust, has rarely been sampled deeper than 2 or 3 km.

The deepest borehole drilled for scientific purposes is located on the Kola Peninsula near Murmansk, Russia, in the northwestern part of the Baltic Shield. The drilling of the main borehole began in 1970, and a final depth of 12,262 metres was reached in 1994. The drilling of this and other deep and superdeep wells has produced one surprise after another, and the findings have been extremely embarrassing for earth scientists [1]. One scientist commented: 'Every time we drill a hole we find the unexpected. That's exciting, but disturbing.' And a science reporter remarked: 'Kola revealed how far from truth scientific theory can roam.'

At the Kola hole, scientists expected to find 4.7 km of metamorphosed sedimentary and volcanic rock, then a granitic layer to a depth of 7 km (the 'Conrad discontinuity'), with a basaltic layer below it. The granite, however, appeared at 6.8 km and extends to more than 12 km; no basaltic layer was ever found! Seismic-reflection surveys, in which sound waves sent into the crust bounce back off contrasting rock types, have detected the Conrad discontinuity beneath all the continents, but the standard interpretation that it represents a change from granitic to basaltic rocks is clearly wrong. Metamorphic changes brought about by heat and pressure are now thought to be the most likely explanation.

Figure. The 64-metre drill-rig enclosure over the 12-km-deep Kola borehole [2].

The superdeep borehole at Oberpfälz, Germany, was expected to pass through a 3-to-5-km-thick nappe* complex into a suture zone formed by a supposed continental collision. The borehole reached a final depth of 9101 m in 1994, but no evidence supporting the nappe concept was found. What the scientists did find was a series of nearly vertical folds that had failed to show up on seismic-reflection profiles.

*A nappe is a large sheet or mass of rock that has been thrust from its original position by earth movements.

Rock density is generally expected to increase with depth, as pressures rise. Results from the Kola hole indicated that densities did increase with depth initially, but at 4.5 km the drill encountered a sudden decrease in density, presumably due to increased porosity. The results also showed that increases in seismic velocity do not have to be caused by an increase in rock basicity. The Soviet Minister of Geology reported that 'with increasing depth in the Kola hole, the expected increase in rock densities was therefore not recorded. Neither was any increase in the speed of seismic waves nor any other changes in the physical properties of the rocks detected. Thus the traditional idea that geological data obtained from the surface can be directly correlated with geological materials in the deep crust must be reexamined.'

The results of superdeep drilling show that seismic surveys of continental crust are being *systematically misinterpreted*. Much of the modelling of the earth's interior depends on the interpretation of seismic records. If these interpretations are wrong at depths of only a few kilometres, how much reliance can be placed on interpretations of the earth's structure at depths of hundreds or thousands of kilometres beneath the surface?!

Contrary to expectations, signs of rock alteration and mineralization were found as deep as 7 km in the Kola well. The hole intercepted a copper-nickel ore body almost 2 km below the level at which ore bodies were thought to disappear. In addition, hydrogen, helium, methane, and other gases, together with strongly mineralized waters were found circulating throughout the Kola hole. The presence of fractures open to fluid circulation at pressures of more than 3000 bars was entirely unexpected. The drillers at Oberpfälz discovered hot fluids in open fractures at 3.4 km. The brine was rich in potassium and twice as salty as ocean water, and its origin is a mystery.

Another surprise at the Kola hole was that lifeforms and fossils were discovered several kilometres down. Microscopic fossils were found at depths of 6.7 km. 24 species were identified among these microfossils, representing the envelopes or coverings of single-cell marine plants known as plankton. Unlike conventional shells of limestone or silica, these coverings were found to consist of carbon and nitrogen and had remained remarkably unaltered despite the high pressures and temperatures to which they had been subjected.

It is generally assumed that temperature increases with depth, reaching 1000°C at a depth of about 80 km, 4800°C at the core-mantle boundary, and 6900°C at the earth's centre. It is certainly true that mine shafts and oil drilling operations have indicated significant increases of temperature with depth. Indeed, superdeep drilling has shown that temperature increases with depth far more rapidly than predicted. In the Kola borehole, the temperature at 10-km depth was 180°C rather than the expected 100°C. Measurements revealed significant vertical variations in temperature gradient and heat-flux density along the borehole. Overall, the rate of temperature increase rose from 11° to 24°/km down to a depth of nearly 7 km, and then started to decline. Geologists recognize that the rate of temperature increase must drop off sharply at a certain depth as otherwise the mantle would be molten below about 100 km (even at the enormous pressures assumed to exist there), whereas seismic evidence indicates that it is solid.

The oceanic crust is commonly divided into three main layers: layer 1 consists of ocean-floor sediments and averages 0.5 km in thickness; layer 2 consists largely of basalt and is 1.0 to 2.5 km thick; and layer 3 is assumed to consist of gabbro and is about 5 km thick. A drillhole in the eastern Pacific Ocean has been reoccupied four times in a 12-year span, and has now reached a total depth of 2000 m below the seafloor. Seismic evidence suggested that the boundary between layers 2 and 3 would be found at a depth of about 1700 m, but the drill went well past that depth without finding the contact between the dikes of layer 2 and the expected gabbro of layer 3. Either the seismic interpretation or the model of layer 3's composition must be wrong [3].

As already mentioned, plate tectonics requires the crust beneath the oceans to be relatively young (no older than early Mesozoic), yet thousands of older rocks have been found in the world's oceans, and the geological and geophysical evidence already available strongly suggests that deeper ocean drilling will uncover more ancient sediments (including further remnants of continental landmasses) beneath the basaltic layer 2 that is currently -- and conveniently -- labelled 'basement' [4]. This layer suggests that magma flooding was once ocean-wide, and studies of ocean sediments show that this activity was accompanied by progressive crustal subsidence in large sectors of the present oceans, beginning in the Jurassic.

3. Mass, density, and seismic velocity

If the earth's interior were homogeneous, consisting of materials with the same properties throughout, seismic waves would travel in a straight line at a constant

velocity. In reality, waves reach distant seismometers sooner than they would if the earth were homogeneous, and the greater the distance, the greater the acceleration. This implies that the waves arriving at the more distant stations have been travelling faster. Since seismic waves travel not only along the surface but also through the body of the earth, the earth's curvature will clearly result in stations more distant from an earthquake focus receiving waves that have passed through greater depths in the earth. From this it is inferred that the velocity of seismic waves increases with depth, due to changes in the properties of the earth's matter.

Seismic velocity in different media depends not just on the substance's density but also on its elastic properties (i.e. rigidity and incompressibility). In the case of solids and liquids, for instance, there is no correlation between sound-wave velocity and density [1]. Here are some examples involving metals:

Substance	Density (g/cm^3)	Velocity of longitudinal waves (km/s)
aluminium	2.7	6.42
zinc	7.1	4.21
iron	7.9	5.95
copper	8.9	4.76
nickel	8.9	6.04
gold	19.7	3.24

There *is* a correlation between density and seismic velocity in the case of gases: velocity *decreases* with increasing density due to the increased number of collisions.

According to the relevant equations,* the velocity of seismic waves will become *slower*, the *denser* the rocks through which they pass, if the rocks' elastic properties change in the same proportion as density. Since seismic waves accelerate with depth, this would imply that density *decreases*. However, scientists are convinced that the density of the rocks composing the earth's interior *increases* with depth. To get round this problem, they simply assume that the elastic properties change at a rate that more than compensates for the increase in density. As one textbook puts it:

> Since the density of the Earth increases with depth you would expect the waves to slow down with increasing depth. Why, then, do both P- and S-waves speed up as they go deeper? This can only happen because the incompressibility and rigidity of the Earth increase faster with depth than density increases. [2]

Thus geophysicists simply adjust the values for rigidity and incompressibility to fit in with their preconceptions regarding density and velocity distribution within the earth! In other words, their arguments are circular.

*P-wave velocity = square root of [(incompressibility + 4/3rigidity) divided by density]. S-wave velocity = square root of [rigidity divided by density]. In a fluid, rigidity vanishes and S waves cannot propagate at all.

Drilling results at the Kola borehole revealed significant heterogeneity in rock composition and density, seismic velocities, and other properties. Overall, rock porosity and pressure increased with depth, while density *decreased*, and seismic

velocities showed no distinct trend [3]. In the Oberpfälz pilot hole, too, density and seismic velocity showed no distinct trend with increasing depth [4]. Many scientists believe that at greater depths, the presumed increase in pressures and temperatures will lead to greater homogeneity and that reality will approximate more closely to current models. But this is no more than a declaration of faith.

Scientists' conviction that density increases with depth is based on their belief that, due to the accumulating weight of the overlying rock, pressure must increase all the way to the earth's centre where it is believed to reach 3.5 million atmospheres (on the earth's surface the pressure is *one* atmosphere). They also believe that they know by how much rock density increases towards the earth's centre. This is because they think they have accurately determined the earth's mass (5.98×10^{24} kg) and therefore its *average* density (5.52 g/cm³). Since the outermost crustal rocks -- the only ones that can be sampled directly -- have a density of only 2.75 g/cm³, it follows that deeper layers of rock must be much denser. At the centre of the earth, density allegedly reaches 13.5 g/cm³.

Pari Spolter casts doubt on this model:

> About 71% of the earth's surface is covered by oceans at an average depth of 3795 m and mean density of 1.02 g cm^{-3}. The average thickness of the crust is 19 km and the mean crustal density is 2.75 g cm^{-3}. From studies of seismic wave travel time, geophysicists have outlined a layered structure in the interior of the earth. There is no accurate way currently known of estimating the density distribution from seismic data alone. To come up with a mean density of 5.5, earth models assuming progressively higher density values for the inner zones of the earth have been devised. . . .
>
> Except for the ocean and the crust, direct measurements of the density of the inner layers of the earth are not available. This currently accepted Earth Model is inconsistent with the law of sedimentation in a centrifuge. The earth has been rotating for some 4.5 billion years. When it was first formed, the earth was in a molten state and was rotating faster than today. The highest density of matter should have migrated to the outer layers. Except for the inner core, . . . the density of the other layers of the earth should be less than 3 g cm^{-3}.
>
> Also, heavy elements are rare in the universe. How could so much of materials with such low stellar abundances have concentrated in the earth's interior? [5]

The figures given for the masses and densities of all planets, stars, etc. are *purely theoretical*; nobody has ever placed one on a balance and weighed it! The masses of celestial bodies can be calculated from what is known as Newton's form of Kepler's third law. Kepler's law states that the ratio of the cube of the mean distance (r) of each planet from the sun to the square of its period of revolution (T) is always the same number (r^3/T^2 = constant). Newton's version of this law assumes that r^3/T^2 is equal to the inert mass of the body multiplied by the gravitational constant divided by $4\pi^2$ ($GM = 4\pi^2 r^3/T^2$). Even if the conventional figures for the total mass and average density of the earth are correct, the prevailing earth model may still be very wrong since no one

knows for certain what type of matter exists at the very centre of the earth.

The Devil's Dictionary defines gravitation as: 'The tendency of all bodies to approach one another with a strength proportioned to the quantity of matter they contain – the quantity of matter they contain being ascertained by the strength of their tendency to approach one another'! Such is the circular logic on which standard gravity theory is based. It should be borne in mind, however, that weight is always a relative measure, since one mass can only be weighed in relation to some other mass. The fact that observed artificial satellite speeds match predictions can be seen as evidence that the fundamentals of newtonian theory must be correct. On the other hand, the net gravitational force need not be directly proportional to inert mass, for there is plenty of evidence that characteristics such as spin and charge can modify a body's gravitational properties [6].

4. Deep earthquakes

Most earthquakes are shallow, no deeper than 20-25 km, and occur when rocks snap and fracture under increasing stress. Earthquakes at much greater depths pose a major challenge to the standard earth model because below about 60 km, the rocks should be so hot and tightly compacted that they become ductile; instead of breaking catastrophically under stress, they should deform or flow plastically. Yet 30% of earthquakes occur at depths exceeding 70 km, and some have been recorded as far down as 700 km. Most deep-focus earthquakes occur in Benioff zones; in plate-tectonic theory these deep-rooted fault zones are labelled 'subduction zones', where slabs of ocean lithosphere supposedly plunge into the earth's mantle (though there is abundant evidence contradicting this hypothesis [1]). However, some deep earthquakes have shaken Romania and the Hindu Kush where there are no 'subduction zones'. A variety of mechanisms for deep earthquakes have been proposed, but they are all controversial [2].

The seismic radiation of deep earthquakes is similar to that of shallow earthquakes. It used to be said that deep-focus earthquakes were followed by fewer aftershocks than shallow ones, but there are indications that many of the aftershocks are simply difficult to detect, and that there is much more activity at such depths than is currently believed. The fact that deep earthquakes share many characteristics with shallow earthquakes suggests that they may be caused by similar mechanisms. However, most earth scientists are incapable of entertaining the notion that the earth could be rigid at such depths. One exception is E.A. Skobelin, who draws the logical conclusion that since deep-focus earthquakes cannot originate in plastic material but must be linked to some kind of stress in solid rock, the solid, rigid lithosphere must extend to depths of up to 700 km [3].

On 8 June 1994, one of the largest deep earthquakes of the 20th century, with a magnitude of 8.3 on the Richter scale, exploded 640 km beneath Bolivia. It caused the whole earth to ring like a bell for months on end; every 20 minutes or so, the entire planet expanded and contracted by a minute amount. A significant feature of the Bolivian earthquake was that it extended horizontally across a 30- by 50-km plane

within the 'subducting slab'. This undermines the hypothesis that such quakes are caused by olivine within the 'cold' centre of a slab suddenly being transformed into spinel in a runaway reaction when the temperature rises above 600°C. It also undermines the theory that gravity increases with depth; if this were true, the motion of earthquakes at such depths should be nearly vertical [4]. There appears to be something very wrong with scientific theories about what exists and what is happening deep within the earth.

The acceleration due to gravity is 9.8 m/s² at the earth's surface and the prevailing view is that it rises to a maximum of 10.4 m/s² at the core-mantle boundary (2900 km), before falling to zero at the earth's centre. But not all earth scientists agree. Skobelin argues that the normal, downwardly-directed gravitational force may be replaced by a reversed, upwardly-directed force at depths of 2700 to 4980 km, and that the widely-accepted figure of 3500 kilobars for the pressure at the earth's centre, may be an order of magnitude too high [5].

Earthquakes and volcanoes tend to concentrate along certain major fault lines in the earth's crust. The fact that heightened geological activity occurs along these 'plate boundaries' is sometimes hailed as one of the great successes of plate tectonics. However, it is precisely the high incidence of earthquake and volcanic activity that led geologists to label these belts as 'plate boundaries' in the first place! Plate tectonics sheds no light on earthquakes that happen within plates. Officer and Page state: 'We know very little about the mechanisms involved in such intraplate earthquakes, but [they sometimes] illustrate effects that one might expect from a gigantic internal explosion, odd as such a concept may appear' [6].

Thomas Gold has argued that, during its formation, the earth retained large quantities of hydrocarbons in its interior. He holds that various gases are sometimes released from depths of about 150 km, and when they invade the outer brittle layers of rock they weaken them by creating new fractures or reducing friction in existing faults, thereby causing or facilitating earthquakes [7]. The emission of gases (e.g. methane) from the ground is already known to cause mud volcanoes on land, circular pockmarks on the ocean floor, and 'ice volcanoes' or pingos on ice fields. Hydrocarbons and hydrogen are also major components of the gases emitted during major volcanic eruptions.

Eyewitness accounts provide strong evidence that gas emissions also help to cause earthquakes in general, but nowadays scientists tend to ignore these 'subjective' accounts in favour of 'hard' seismic data. Eruptions, flames, roaring and hissing noises, sulphurous odours, hazes and fogs, asphyxiation, fountains of water and mud, vigorous bubbling in bodies of water -- all these are observed today in conjunction with earthquakes, just as they were in past. On the basis of such evidence, the ancients held that the movement and eruption of subterranean 'air' (i.e. gases) caused volcanoes if they found an outlet, and otherwise generated earthquakes. Gold argues that this mechanism could explain deep earthquakes, since he believes that the mechanism of sudden rock shear cannot operate deep in the earth's interior. But as already noted, this belief may be wrong, and both mechanisms may apply at all depths.

5. Geomagnetism

Most earth scientists believe that, as well as having a high density, the earth's core, unlike the mantle, must be metallic in order to generate the geomagnetic field. According to the dynamo theory, fluid motion in the earth's outer core moves conducting material (liquid iron) across an already existing, weak magnetic field and generates an electric current. The electric current, in turn, produces a magnetic field that also interacts with the fluid motion to create a secondary magnetic field. Together, the two fields are stronger than the original and lie essentially along the earth's rotation axis.

The main characteristics of the geomagnetic field include short-term and long-term fluctuations in intensity, reversals of polarity at irregular intervals (ranging from tens of thousands to tens of millions of years), the 11° offset between the geomagnetic axis and spin axis, and the drift of the magnetic poles around the geographic poles in an estimated period of several thousand years. Scientists assume that the dynamo theory can explain these features, though a detailed understanding is lacking. There are competing dynamo models, and a great deal of fudging is required to get the numerical models to reproduce some of the features of the actual magnetic field [1].

To explain the offset between the earth's geomagnetic axis and the spin axis, some scientists maintain that the earth's overall field may be a combination of a central, dynamo-created dipole field, aligned with the rotation axis, and several variable dipole fields located in the outermost portions of the core. But other scientists argue that there is no physical mechanism to generate dipoles near the core's surface [2]. Some planets have even greater and more puzzling tilts between their magnetic and rotation axes: 46.8° in the case of Neptune, and 58.6° in the case of Uranus.

Even assuming that an outer core of liquid iron exists, there are major problems with the dynamo theory. Joseph Cater writes:

> Scientists are somewhat vague as to how a magnetic field could extend 2,000 miles beyond an electric current. It requires a very powerful current to produce even relatively weak magnetic effects a very short distance above the flow. The electrical resistance of iron, at the alleged temperatures of the core, would be staggering. A steady flow of electricity requires constant potential differences. How are such potential differences produced and maintained in this hypothetical core?
>
> The magnitude, width, and depth of such currents would have to be unbelievable to extend the magnetic field even a small fraction of the distance required, and the EMF [electromotive force] required to produce it would be even more incredible. Where could such an EMF come from? So far, scientists seem reluctant to explain this, especially since these currents are confined to a ball and would therefore follow closed paths. [3]

V.N. Larin questions whether a mechanism exists to maintain strong electric currents in the earth's interior during its entire evolution, and argues that the very

existence of active convection in the core is dubious. If convection is of thermal origin, then the source of heat in the iron core is incomprehensible. Another possibility is radioactivity, but no mechanism is known which might have segregated radioactive elements together with iron and nickel. Some scientists think that the heat source of convection may be the ongoing growth of the core. In this case, the heat would come from the potential energy of heavy particles settling in the gravity field, but this is unlikely to have lasted several billion years [4].

An alternative theory has been proposed by J.M. Herndon, who suggests that the earth's magnetic field is largely produced by electric currents generated by a self-sustaining nuclear fission reaction in a uranium (and thorium) subcore at the centre of the earth, having a density as high as 26 g/cm^3 [5]. However, the existence of such a subcore is entirely hypothetical.

Given their belief in the generation of magnetic fields by convection currents of electrically conducting liquid iron in a planet's core, scientists were puzzled by the discovery that the Moon and Mercury had significant magnetic fields, since the Moon's core is believed to be entirely solid and Mercury's core nearly so. Venus is believed to have an entirely liquid core and was expected to possess a strong magnetic field, but no significant self-generated field has been detected. The magnetic fields of Jupiter and Saturn are believed to be generated by electric currents within a layer of liquid metallic hydrogen inside them, while the fields of Neptune and Uranus are thought to be produced in their superheated liquid mantles -- but all this is little better than guesswork [6]. Clearly the present dynamo theory cannot explain the magnetic fields detected around some asteroids.

Alternative theories of the geomagnetic field are considered in part 2, section 4.

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Mysteries of the Inner Earth: Part 2

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Mysteries of the Inner Earth

David Pratt

May 2001

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Part 2: The Hollow Earth Hypothesis

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1. Early theories

Since the scientific revolution, a small number of notable scientists have proposed the possibility of a hollow earth. One of the first was the famous English astronomer and mathematician, Sir Edmond Halley (1656-1742) [1]. He held that the earth had an outer crust, 500 miles thick, and a hollow interior containing three smaller spheres, one within the other, approximately the size of Venus, Mars, and Mercury, each sphere being separated from the next by 500 miles of atmosphere. The smallest sphere was thought to form a hot, solid core. Halley speculated that the inner spheres might be inhabited, and that light might be produced in a number of ways: the atmosphere might be luminous, or the inner sides of the spheres might emit light, or there might be small suns within the earth.

Halley's theory of concentric spheres largely stemmed from his efforts to explain why the earth's magnetic poles appeared to be wandering. He believed that each sphere had its own set of magnetic poles, and that the outer sphere moved slightly faster than the rest, causing magnetic variations. Halley presented his theory to the

Royal Society in 1692; it attracted a great deal of attention and was reprinted several times, though not many scientists took it seriously.

Leonhard Euler (1707-1783), the noted Swiss mathematician and physicist, also speculated about a hollow earth. In 1767 he proposed that the earth's hollow interior contained at its centre a small glowing core which served as a miniature sun for the inner world's hypothetical inhabitants [2]. Sir John Leslie (1766-1832), a Scottish physicist and mathematician, proposed that the earth had a hollow interior containing *two* suns, Pluto and Proserpina [3]. Jules Verne's classic tale *Journey to the Centre of the Earth* (1864) was partly inspired by Leslie's ideas.

The idea of a hollow earth has received little interest from scientists since then, but there have been occasional exceptions. In 1892, C. Lapworth wrote:

> everywhere we find evidences of symmetrical crushing-in of the earth-crust by tangential stresses. Everywhere we find proofs that different layers of that crust have been affected differentially, and the outer layers have been folded the most. We seem to be dealing, not with a solid globe, but with a globular shell composed of many layers.
>
> Is it not just possible that our earth is such a hollow shell, or series of concentric shells, on the surface of which gravity is at a maximum, and in whose deepest interior it is practically non-existent? May this not be so, also, in the case of the sun, through whose spot-eddies we possibly look into its hollow interior? [4]

A name often mentioned in connection with the hollow-earth theory -- usually in order to ridicule it -- is Captain John Cleves Symmes (1779-1829) [5]. He believed that the earth's interior was hollow, containing another four hollow, concentric spheres, with space between each, and habitable on both their concave and convex surfaces. He held that all celestial bodies had a similar structure. He estimated that the earth's outer shell was 1000 miles thick. Unlike Halley, he believed that there were enormous holes at the poles: 4000 miles across (12°) at the north, and 6000 miles (16°) across at the south, both being slightly askew. He argued -- quite wrongly -- that the refraction of sunlight percolating through the holes would be sufficient to cause the whole inner world to be lit with a perpetual day.

It is difficult to see how a newly forming planet could become a series of concentric spheres. But Symmes managed to interpret the rings of Saturn and the cloud belts of Jupiter as evidence for his theory. His arguments for gigantic polar openings were not very compelling either. He cited the supposedly abnormally warm climate in the polar regions, and believed that there was no ice beyond a certain latitude. He also invoked the alleged northerly migration of polar birds and animals, the erratic behaviour of the compass near the poles, and the aurora borealis, which he believed was caused by the sun's rays reflecting off the internal oceans and emerging through the polar holes. He held that polar explorers had probably sailed some distance over the rim of the openings, but not far enough to realize where they were.

Symmes' notion of polar openings earned him a great deal of ridicule. References to 'Symmes' hole' were common in the 1820s. If someone suddenly disappeared, the reply was often: 'Oh, I expect he's gone down into Symmes' hole.' Symmes

announced that he was prepared to lead an expedition to the inner world. He said that his only terms were 'the patronage of this and the new world', and that he dedicated his quest to his wife and her ten children. On at least nine occasions, petitions signed by hundreds of Symmes' supporters were presented and debated before the US House of Congress with the goal of financing such an expedition, but without success. However, enthusiasm for Symmes' ideas appears to have been largely responsible for the US Exploring Expedition of 1838-1840, which first determined that the Antarctic was of continental dimensions.

Figure. Symmes' gaping hole.

1871 saw the publication of *The Hollow Globe* [6], a book written by Wm.F. Lyon, based on information channelled through M.L. Sherman, a clairvoyant. The central idea of the book is that the earth is a hollow sphere, with a shell some 30 to 40 miles thick, and that the interior surface is a beautiful world, in a more highly developed condition than the exterior, and is accessible by a spirally formed aperture located in the 'unexplored open polar sea'. The earth's inner concave surface is said to be habitable. The book presents various arguments against the then widely-held theory that beneath its thin crust the earth was filled with molten lava. It suggests that spiritual powers or 'world-builders' made all planets hollow, because that is the simplest and most economical shape, providing the greatest amount of strength compatible with the smallest amount of material.

The book by Lyon and Sherman was reviewed in the July 1884 issue of *The Theosophist* [7]. The article is unsigned, implying that it was written by the editor, H.P. Blavatsky. She says that the book shows a high grade of intelligence and that the 'spirit' which inspired it was probably an adept, and possibly one of the adepts behind the founding of the Theosophical Society. She concludes that 'like other works of a similar character this book has appeared, before the world was ripe enough to understand it, and it is therefore known and appreciated by only comparatively few'.

She expresses the hope that the author will fulfil his desire to enter the earth's interior, 'if not in his present incarnation, then in the next, as a member of the sixth race, forerunners of which have already made their appearance upon this, the exterior surface of our hollow globe'.*

*For an overview of the paradoxical statements on this subject found in modern theosophical literature, see **Theosophy and the hollow earth**, http://davidpratt.info/hollow.htm.

Another notable book is *Etidorhpa or The End of Earth* by John Uri Lloyd, first published in 1895 [8]. Written in the form of a novel -- a story within a story -- it appears to contain a certain amount of scientific and esoteric information.* The earth is depicted as hollow, with an outer shell 800 miles (1280 km) thick. (This is certainly more plausible than the figure of 30-40 miles (50-65 km) given by Lyon and Sherman; some hollow-earthers suggest a figure of 1000 miles or even 2000 or more miles.) The shell is said to be honeycombed with caverns, containing a wide variety of plant and animal life. At a certain depth below the earth's surface, the earth begins to generate its own luminosity. Gravity is said to increase to a depth of about 10 miles (16 km) below sea level, and then to steadily decrease, reaching zero at the 'sphere of rest', 700 miles (1120 km) below the outer surface, and 100 miles (160 km) from the inner surface. No details are given of the inner world, or inner circle, but the implication is that it is habitable.

*In his book debunking the hollow-earth theory, Kafton-Minkel describes *Etidorhpa* as a unique work and the most remarkable of the inner-world novels. ('Etidorhpa' is 'Aphrodite' spelt backwards.)

The book was formerly sold by the publishing company of the Point Loma Theosophical Society, and the following notice appeared in the May 1896 issue of its journal, *Theosophy* (p. 62): 'One of the most fascinating books which has appeared for years is *Etidorhpa*. It is fiction of the most scientific kind, full of facts as well as, to the average man, full of theories, and a vein of the most serious occultism runs through its 360 pages. The author, John Neri [Uri] Lloyd, is one of the best-known chemists in America, and his book has aroused wonderful interest among scientific and literary people. It is safe to say that no book on such lines has set so many people hard a-thinking in years. It will possess additional interest to members of the T.S. by reason of the many illustrations by one of our devoted members, J. Augustus Knapp of Cincinnati.'

In *Living Energies* (Bath: Gateway Books, 1996), Callum Coates draws attention to the important information provided in *Etidorhpa* on the functioning of springs and artesian wells (pp. 133-4). He also writes: 'in keeping with all other globular cell-structures, the Earth [may be] hollower than we presently think, which may be why it resonates like a bell when seismic charges are set off. Solid bodies do not resonate so readily' (p. 86).

2. Modern theories

The Phantom of the Poles by William Reed was published in 1906 [1], and *A Journey to the Earth's Interior* by Marshall B. Gardner was first published in 1913 [2]. These two books have had an enormous influence on virtually all subsequent writers on the hollow earth. On the basis of the accounts of polar explorers, both authors came to the conclusion, quite independently of each other, that at the north and south poles there were large entrances to the earth's interior. Reed held that the earth's shell was 1000 miles thick, and that the southern polar opening was 1500 miles in diameter and the northern one 1000 miles in diameter. Gardner believed that the earth's shell was 800 miles thick, and both openings 1400 miles across. Reed, like Symmes, seemed to think that sunlight shining into the polar openings would be sufficient to illuminate the interior, while Gardner revived Euler's idea of a central sun, which he thought was 600 miles in diameter. Like Symmes, Gardner was an evangelist, and mailed scores of copies of his book to professors, legislators, presidents, and kings.

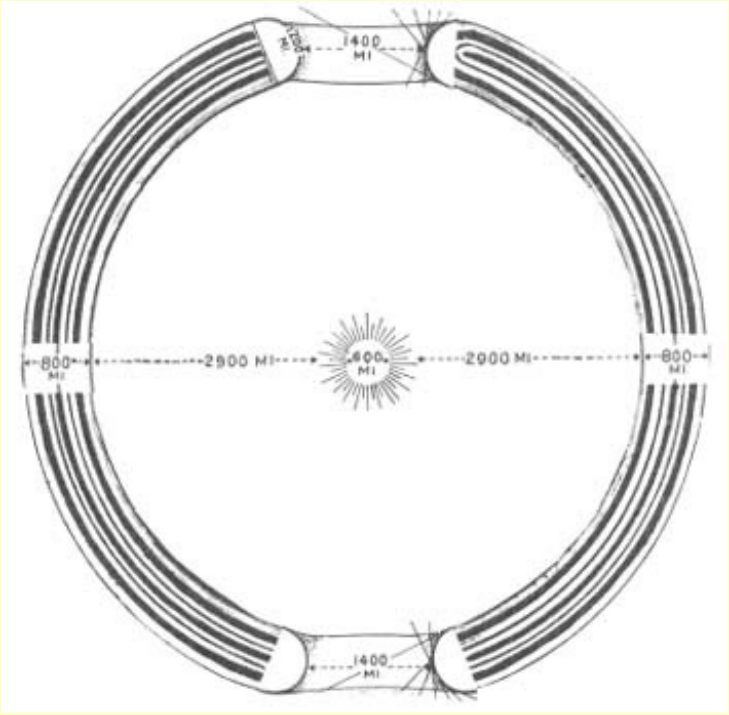

Figure. The earth according to Gardner.

If a gigantic polar hole *did* exist, and if the earth's convex outer surface curved smoothly inward until it became the inner concave surface, it would in theory be possible to walk or sail from the earth's exterior to the interior and back. The highest point of the rim or verge around the entire hole would be the 'north pole' in the sense that the polestar would be directly above the head of a person standing there. As the rim was approached, a degree of latitude would become ever shorter, giving explorers the impression that they had travelled much further than expected.

Many of the arguments for large polar holes presented by Gardner and Reed are the same as Symmes'. Most are very feeble and some are patently ridiculous. Reed, for example, argued that the flattening of the poles (which he apparently understood to mean that the poles were literally flat!) proved that there must be a polar opening, as this would detract from the earth's roundness. As a example of how the hollow earth with its central sun may have formed, Gardner cited the Ring Nebula in the constellation Lyra, which looks like shells of gas surrounding a star, and which he believed would eventually contract into a planet with a central sun. Such nebulae were in fact called 'planetary nebulae' in the astronomy texts of that day because they look much like planets in low-powered telescopes. However, the central star of the Ring Nebula is much larger than any known planet, and the shell of gas surrounding it, millions of miles across, is expanding, not contracting, as the Ring Nebula is the remnant of a nova or exploding star. Gardner also believed that the Andromeda Nebula was in the early stages of becoming a planet, whereas it is now known to be a galaxy larger than the Milky Way!

Reed, writing in 1906, argued that the reason the north pole had not been discovered was because it did not exist on the earth's surface but in midair, in the centre of the polar opening. Gardner, on the other hand, published his book several

years after the north pole had apparently been reached: Dr Frederick A. Cook claimed to have reached it in April 1908, and Commander Robert E. Peary in April 1909. However, Gardner highlighted the bitter dispute that erupted between these two explorers and their supporters (see part 3). He suggested that both had spent weeks wandering lost on the verge of the northern polar hole, and that Peary in particular may have had a problem telling the truth.

Both Reed and Gardner assumed that the inner world had a warm climate and that warm air escaping through the northern polar hole caused the Arctic to be abnormally warm. However, while carefully selecting examples of polar explorers encountering warm conditions in certain parts of the Arctic, they tend to ignore the bitter cold that is far more prevalent. It is well known that the climate within the arctic circle varies greatly depending on latitude, proximity of the sea, elevation, and topography, and that warm ocean currents around some of the arctic coasts allow an abundance of marine life.

In the northern hemisphere the zone of lowest temperature (the 'cold pole') lies in eastern Siberia, several hundred kilometres *south* of the arctic circle, in a region far removed from the moderating influence of the ocean. Here temperatures as low as -71°C have been recorded. At Olekminsk, which lies some 1100 km from the nearest ocean, the temperature can be as low as -60°C in the winter but as high as 45°C in the summer -- the greatest temperature range in the world; its all-year average is about 0°C. The lowest all-year temperatures are found in the Greenland interior, with an all-year average of -29°C. This is because, in contrast to the thin ice cover in Siberia, the Greenland ice sheet never completely melts in summer [3]. On 5 April 1969 Wally Herbert and his Transarctic Expedition team found the temperature at the north pole to be -37.2°C. Obviously Reed and Gardner's hot air must have been blowing in the wrong direction at the time!

Reed and Gardner propagated the view that instead of an ice-covered ocean in the far north, there was an open polar sea. This view was held by many 19th-century explorers but was disproven by Fridtjof Nansen's epic voyage in the *Fram* from 1893 to 1896, though Reed and Gardner managed to convince themselves otherwise (see part 3).

Reed argued that polar meteor showers, and the dust and stones found in arctic ice were the debris of volcanic eruptions in the interior world, and that coloured snow was caused by massive amounts of pollen originating from lush plant and flower growth inside the earth. Gardner claimed that the frozen mammoths found in Alaska and Siberia were from the earth's interior; they had allegedly died while searching for food, fallen into the ice and been quick-frozen, and had then been carried over the verge of the opening by ocean currents. The reason they were often well-preserved was because they had died only recently. However, many mammoth carcasses have been found frozen into the tundra hundreds of miles from the ocean and the vast majority are *not* well preserved.

Reed and Gardner drew attention to the fact that birds, polar bears, foxes, and musk oxen in the Arctic had been seen moving north for the winter, and that this had given many polar explorers the impression that a warm continent must exist near the north

pole. Reed and Gardner believed the land actually lay inside the earth. Debunkers of the hollow-earth theory dismiss polar explorers' anomalous observations of animal movements as fragmentary and unreliable [4].

Reed and Gardner speculated that the earth's interior was probably inhabited. Gardner believed it was the original home of both the Eskimos and all the East Asian peoples. He even suggested that the 'up and outward position' of Chinese eyes may be 'a modification of the ordinary eye position induced by the fact that in the interior the sun is always in the zenith'! He called on all fellow-patriots to urge the American government to mount an expedition to colonize the inner world, as this 'would add the most glorious page yet written to the annals of the United States'.

Much of what was written on the hollow earth during the 20th century is of little or no value. Many of Reed and Gardners' arguments have been trotted out time and again, while the results of later exploration have been largely ignored. Perhaps the most widely-read book on the subject is *The Hollow Earth* (1963), written by Dr Raymond Bernard [5], which rehashes most of the flimsiest and silliest arguments for a hollow earth with large polar openings. Many explorers have now walked or sledged to the poles, flown over them, satellites have photographed them, and there is a permanently manned base at the south pole. A number of expeditions have crossed directly across the north and south poles, and some have approached each other from different parts of Antarctica and met at the correct spot. But no polar openings have apparently been discovered. At least, none are marked on maps. This is seen by many hollow-earthers as evidence of a vast international conspiracy [6]!

1998 saw the publication of Jan Lamprecht's book *Hollow Planets* [7], which attempts to tackle the issue from a more scientific angle. But he, too, believes that there is a massive coverup taking place to conceal smaller polar holes, measuring perhaps 200 miles across, and offset from the geographic poles (see part 3). Lamprecht at least puts paid to the idea that a large northern polar opening can be seen on certain satellite photos [8] -- which some writers claim were released to the public before the authorities realized what they showed and before the photos could be falsified or suppressed. The 'holes' mostly turn out to be storms and temporary circular air currents. What's more, they are found in all manner of locations: for instance, one satellite photo shows a feature 900 miles in diameter over the Kamchatka Peninsula in Russia (see figure below), while another shows a feature 800 miles across over Greenland. But it seems that for some hollow-earthers even a polar opening that changes size and jumps from place to place is preferable to none at all!

Figure. A hole in the pole? [9]

3. Hollow moons

Although mainstream scientific interest in the possibility of a hollow earth is nonexistent, there has been a small amount of speculation about hollow moons. In 1959, Soviet scientist Iosif Shklovsky argued that the acceleration of Phobos (the inner moon of Mars) was so large that it had to be hollow, given the calculated drag force and mass, and might therefore be artificial. However, he later discarded this theory as the acceleration proved to be much smaller and the atmospheric model incorrect [1].

In the mid-1970s, two senior Soviet scientists, Mikhail Vasin and Alexander Shcherbakov, suggested that the earth's moon was partially hollow. Unable to believe that it could be naturally hollow, they argued that it had been partially hollowed out by an alien civilization, which turned it into a huge spaceship and steered it into orbit around the earth. This theory was then elaborated upon by Don Wilson [2].

One of their arguments was that the chance of the earth capturing the moon by accident is extremely tiny, and the chances of this resulting in a circular orbit such as the moon now has are even tinier. Another argument was that the moon's (theoretical) density is much less that the earth's (3.3 as opposed to 5.5 g/cm^3). They also pointed out that moon craters, even those 100 miles or more across, are only a mile or two deep whereas the largest ought to be 24-30 miles deep. They argued that the consistently shallow depth of craters (most of which are assumed to be due to impacts) was the result of the moon having a 20-mile layer of metallic armour plating beneath the 2.5-mile-thick outer layer of rock. Another argument was that when lunar modules and spent rocket stages were made to crash into the moon, it rang like a bell (or a huge hollow sphere) for up to four hours; moreover, the shock waves started small, then built up to a peak, before dying away. This was completely unexpected.

Several other scientists have pointed to facts that could indicate that our moon is hollow, though this possibility has never been entertained very seriously. For

instance, in 1962, a NASA scientist, Dr G. McDonald, wrote in *Astronautics*: 'If the astronomical data are reduced, it is found that the data require that the interior of the Moon be less dense than the outer parts. Indeed, it would seem that the Moon is more like a hollow than a homogenous sphere' [3]. McDonald did not accept this conclusion and assumed that either the data or the calculations must be wrong. Dr S.C. Solomon of MIT claimed that a study of the gravitational field of the moon indicated that it could be hollow. He concluded his study, published in *The Moon, An International Journal of Lunar Studies*, as follows: 'The Lunar Orbiter experiments vastly improved our knowledge of the Moon's gravitational field . . . indicating the frightening possibility that the Moon might be hollow' [4]. On the basis of seismic data, various models of the moon were produced. In 1974 *Science News* reported that 'Some such models would have made for a rather bizarre Moon, such as a hollow titanium ball' [5]. The moon's seismic behaviour is now considered to be compatible with its solidity.

4. Feasibility -- I

According to a modern geological textbook: 'Geologists could be wrong about the earth's interior, but the current model of a solid rock mantle and a liquid metallic core with a solid inner core is widely accepted because it is consistent with all available knowledge. A hollow earth is not' [1]. Three objections to a hollow earth are mentioned:

1) it would not have seismic-wave shadow zones;
2) it would not have an average density of 5.5 g/cm^3;
3) it would not have a magnetic field.

All these objections make the convenient assumption that current theories of seismicity, gravity, and geomagnetism are correct, but as shown in part 1, there is good reason to doubt this. The solid-earth model is based on assumption upon assumption about every parameter.

Regarding the second objection, it has already been shown that the true mass and density of the earth are unknown. The other two objections are considered below.

Seismology

The dominant boundary in the earth's interior is believed to be that between the mantle and outer core. The vast majority of seismic waves are thought to travel through the mantle and many bounce back and forth between the earth's outer core and the surface. Very few are believed to penetrate the outer core, and even fewer pass through the inner core. The depth of the core-mantle boundary is said to be 2900 km, but this is likely to be wrong if scientists are wrong about the density distribution within the earth. As shown in part 1, seismologists are known to be making systematic errors in their interpretations of seismic data even in the outer few kilometres of the earth's crust.

As mentioned earlier, there are two main types of seismic waves that pass through the body of the earth: P waves and S waves. P waves can travel through solids,

liquids, and gases, while S waves can only travel through a solid medium. Because no S waves appear beyond 103° from an earthquake epicentre, scientists have concluded that S waves do not penetrate the core. P waves, on the other hand, are almost entirely absent between approx. 103° and 142° from the epicentre of an earthquake, from which it is concluded that they *do* penetrate the outer core, but are sharply refracted when entering and leaving, thus creating the 'shadow zone'. Scientists infer from this that the outer core is liquid. Theoretically, it could be gaseous, but this is regarded as impossible.

It could be argued that what scientists call the crust and mantle corresponds to the outer solid shell of a hollow earth, while the outer core is the 'hollow' cavity, and the inner core is the central sun. Scientists maintain that P waves, but not S waves, pass through the liquid 'outer core'. But would this be possible if the outer core were really a 'hollow' cavity? Clearly, hollow-earthers would not argue that the earth's interior is an absolute void. The earth's *outer* surface is covered by a gaseous atmosphere, the outer regions of which are an ionized gas (plasma), which thins until it merges into the interplanetary medium (an even more attenuated plasma), which stretches to the sun (believed to be a ball of plasma). The space between the earth's *inner* surface and an *inner* sun may contain similar grades of matter.

But would such a model be able to reproduce the travel times of P waves that in the current model are thought to have travelled through the dense 'outer core'? At the outer core, P-wave velocity is said to fall from about 13.6 to 8.1 km/s. This need not be exactly true, for although the overall travel times of seismic waves are known with a high degree of precision, the exact path and varying velocities of seismic waves within the earth are impossible to determine. However if, in the hollow-earth model, we place a thin atmosphere above the inner surface, then seismic-wave speeds in it may be only a fraction of the 'scientific' value; in the outer atmosphere the speed of sound is only 331 *metres* per second! So this model will probably only work if we assume that the inner cavity contains an etheric medium through which seismic waves can propagate at much faster speeds. Although the existence of an all-pervading medium of subtler, etheric matter is a logical necessity, whether it would allow the effects described here is unknown.*

*Substituting 'empty space' and field equations for an all-pervading medium is unsatisfactory; abstract mathematical descriptions *explain* nothing (see **Space, time, and relativity**, http://davidpratt.info/relativ.htm).

Light propagates through the ether rather than an absolute void. It is known that certain electromagnetic waves in the atmosphere can produce sound waves when they strike the earth. But the speed of light is some 33,000 times greater than the theoretical seismic velocities in the 'outer core'.

If the force of gravity on both the outer and inner surfaces of the earth's solid shell is directed 'downward', i.e. into the shell, there must be a zone of zero gravity somewhere within the shell, where these two forces cancel. *Etidorhpa* places this 'energy shell' or 'sphere of rest' at a depth seven eighths of the distance from the outer to the inner surface. Such a zone might reflect S waves and most P waves. Some of the P waves that pass through it, or perhaps the vast majority, might then be channelled around the earth between the inner surface and the energy sphere, with most of them being refocused on the other side of the earth, thereby creating the P-wave shadow zones. In this model, rather than P waves travelling more slowly through the 'outer core' than through the mantle, most may not travel through the cavity at all but make a detour around it, so that their slower speed is only apparent.

However, if virtually no P waves travel through the cavity, some explanation other than a central sun would be needed to account for the seismic data that suggest an 'inner core'.

Seismic data alone cannot determine whether the earth is solid or hollow, because they cannot be interpreted without making certain fundamental assumptions. As indicated in part 1, the conventional assumptions about gravitational acceleration, density, and pressure within the earth are open to doubt. It is therefore possible that seismic waves follow different paths and have different velocities than scientists think, and that the standard earth model is far removed from reality.

Geomagnetism

A hollow earth would require a new theory of geomagnetism since it would rule out the present dynamo model -- which, as shown in part 1, is highly dubious anyway. A number of alternative mechanisms have been put forward, but none has won widespread support [2]. Magnetism is caused by charged particles in motion, and an alternative theory is that the earth's magnetic field is generated by charges in the earth's atmosphere and the crust, which are carried with the earth as it rotates. The main objection to this theory is that planets would have to have enormous electric fields in their atmospheres and there is no evidence of this. But nor is there any evidence disproving it; the earth's background electric charge cannot be measured directly from the earth itself [3].

A rotating planet can be compared to an electrical solenoid [4]. A solenoid consists of a coil of wire, and when a current is passed through it, a magnetic force is generated at right angles to the direction of the wire. Since planets carry charges with them in their atmosphere and crust, this generates electrical currents in the direction of rotation, or east-west. The magnetic field is generated at right angles to this, i.e. north-south.

The most detailed alternative model of the geomagnetic field has been developed by Harold Aspden, who argues that the field is generated mainly by ether spin [5]. More specifically, it arises from charge displacement caused by the spinning ether sphere located within the earth and extending about 100 km above its surface, in conjunction with a balancing charge displacement in the matter constituting the physical earth. Aspden explains that, with a distributed core charge of one polarity and a compensating surface charge of opposite polarity, the earth's rotation would produce a magnetic field that matches what is observed. The reason the magnetic poles are offset from the geographic poles is because the ether sphere spins about an axis that is tilted with respect to the earth's spin axis. And the reason the magnetic poles move around the geographic poles earth is because the ether spin axis precesses around the earth's spin axis.

In the light of Aspden's theory, a spinning, ethereal central sun could play a key role in generating the main magnetic field. Other factors contributing to the irregular and varying nature of the overall geomagnetic field includd electric currents in the ionosphere and magnetosphere, magnetized rocks in the earth's crust, electric currents in the earth's crust (telluric currents), subterranean flows of brines and other conducting fluids, and ocean current effects [6]. The concentration of charges in the

atmosphere fluctuates according to a 24-hour cycle, just as the magnetic field undergoes daily fluctuations. The field increases during solar flares and sunspot activity, when the earth receives more charged particles.

Rocks cannot retain magnetism when the temperature is above the Curie point (about 500° C for most magnetic materials), and in the standard earth model, this restricts magnetic rocks to the upper 40 km of the earth's interior. In the hollow-earth model, on the other hand, only certain parts of the earth's outer shell would probably be above the Curie temperature, and metallic deposits would make a far greater contribution to the earth's permanent magnetism and to regional magnetic anomalies.

Palaeomagnetic studies show that some ancient rocks have been magnetized in a direction opposite to that of the present magnetic field. The scientific consensus today is that the global geomagnetic field at the time these rocks formed had a reversed polarity. In at least some cases, however, rocks with inverse magnetism may have undergone self-reversal at a later stage, or reflect a regional magnetic anomaly. Even today there are isolated spots of opposite magnetic polarity in both the northern and southern hemispheres.

If global magnetic reversals *have* occurred, they could be caused by the sign of the electric charge of the earth or its atmosphere, or the direction of electric currents in the crust or atmosphere being reversed by some mechanism. Aspden suggests that geomagnetic reversals could be due to the solar system periodically entering space domains in which electric polarities are reversed. In addition, an electrochemical cell can self-reverse, and the earth may contain giant electrochemical cells [7]. One of the exernal sources of the earth's magnetic field is the ring current in the outer Van Allen radiation belt. Paul LaViolette argues that very intense solar activity could strengthen the ring-current magnetic field to such an extent that it could reverse the polarity of the earth's main magnetic field [8]. Furthermore, the sunspots of the outer sun are known to undergo polarity reversals in a cycle of about 22 years, and something similar might happen with an inner sun, contributing to magnetic anomalies at the earth's surface.

Given the problems faced by the dynamo theory and the existence of other ways of generating a planetary magnetic field, geomagnetism does not rule out the possibility of a hollow earth.

5. Feasibility -- II

Gravity and isostasy

If the newtonian theory of gravity were correct, there could be no huge caverns in the earth's outer shell and no tunnels connecting the outer and inner worlds. Even a few kilometres beneath the earth's surface the immense pressures would cause any cavities to collapse. Moreover, a habitable inner surface, with gravitational forces holding inhabitants 'down', would be impossible, because the gravitational attraction of the matter beneath their feet would be counteracted by the gravity of the matter forming the earth's shell above their heads -- i.e. on the opposite side of the 'cavity' --

and by the attraction of the inner sun.

However, if, as several experiments suggest, the newtonian assumption that gravity has unlimited penetrability is incorrect, and negative particles and ions can screen or counteract the attractive force of gravity [1], pressures (and temperatures) would not increase steadily with depth, the earth's shell could be honeycombed with cavities and tunnels, and the force of gravity on the inner concave surface would be compatible with life.

Isostasy is the theoretical balance of all large portions of the earth's crust as though they were floating on a denser underlying layer, about 110 km (70 miles) below the surface. Theoretically, if a section of lithosphere is loaded, e.g. by ice, it will slowly subside to a new equilibrium position; and if a section of lithosphere is reduced in mass, e.g. by erosion, it will slowly rise to a new equilibrium position. It might be argued that without a superheated, viscous mantle below the Moho boundary, isostasy would not work. In actual fact, whether the traditional 'mantle' exists or not, the simplistic theory of isostasy has already been shown to have serious shortcomings.

Much of the evidence to support isostasy has come from observations of the apparent rebound of the crust following the retreat of the late Pleistocene ice sheets from northwest Europe and Canada. However, while the north of Sweden appears to be in the process of uplift, as ideas on isostasy require, the southern parts of the country are sinking. Since scientists largely base their estimates of mantle viscosity on selective data on 'postglacial rebound', their estimates are unlikely to be correct.

Antarctica is thought to have supported massive ice sheets for most of the past 15 million years. If the mantle were subject to deformation under such loading, even at a nominal rate of 1 mm/year, the crust there should have subsided by 15 km -- which has obviously not happened. In fact, the Trans-Antarctic mountains, only several million years old, are elevated more than a kilometre above sea level, showing that the lithosphere/mantle is capable of lifting continental ice sheets, rather than being depressed by them. The most concentrated crustal loading of the earth's lithosphere probably occurs beneath large seamounts, since the ocean crust is fairly thin. However, on the basis of the current earth model, Peter James has calculated that the bearing capacity at the Moho is an order of magnitude greater than the imposed loading of a seamount, so that isostasy cannot explain their subsidence [2].

The theory of isostasy is tested by making gravity measurements over the earth's surface. On the assumption that gravity is proportional to inert mass, positive or negative gravity anomalies are interpreted as indicating an excess or deficiency of mass, and therefore departures from isostatic equilibrium. Gravity measurements reveal many large-scale 'isostatic' anomalies. For instance, an enormous area of 'negative mass' covers part of India and most of the adjacent Arabian Sea, yet there is no evidence that the lithosphere there is being upwarped. Moreover, in regions of tectonic activity vertical crustal movements often intensify gravity anomalies rather than acting to restore isostatic equilibrium. For example, the Greater Caucasus shows a positive gravity anomaly (usually interpreted to mean it is overloaded), yet it is rising rather than subsiding. The greatest anomaly of all is the triaxial deformation of the

earth. In addition to the rotation axis and the (43-km-longer) equatorial axis, the earth has a third axis, roughly through the equator; as a result, the equator is a little flattened, being oval rather than truly circular. The earth's shape is distorted by protuberances of various shapes and sizes, equivalent to about 2000 feet of rock, or over a mile of ice, and the anomalies have spans of the order of thousands of miles [3].

The fact that there is no empirical basis for the common assumption that gravity is proportional to mass casts doubt on the standard interpretation of gravity measurements; rather than being a direct function of the quantity of matter, the strength of the gravitational force may depend on the electrical and other properties of matter. The defective theory of isostasy can certainly not be used to lend weight to the orthodox picture of the 'mantle'.

Geological activity

The earth's crust has undergone oscillating uplifts and subsidences throughout geologic history. Most of the sediments forming the continents were laid down under the sea, and the total thickness of sediments is sometimes as much as 20 km, showing that vertical movements of about the same magnitude have taken place. There is also mounting evidence for submerged continental landmasses in the present oceans. It is widely believed that 'mantle' heat flow and vertical and horizontal movements of mantle material can cause significant changes in crustal thickness, composition, and density, resulting in substantial uplifts and subsidences.

Neither vertical crustal movements nor earthquakes and volcanoes require a solid earth, with a high-density, permanently superhot 'mantle'. However, there must certainly be zones within the earth's shell where very high temperatures exist. The theory of surge tectonics postulates that all the major features of the earth's surface, including rifts, foldbelts, metamorphic belts, and strike-slip zones, are underlain by shallow (less than 80-km-deep) magma chambers and channels, known as 'surge channels' [4]. Surge channels and complexes are believed to correspond to linear lenses of anomalous (low-velocity) upper mantle that are commonly overlain by shallower, smaller low-velocity zones. Seismotomographic data suggest that surge channels may form an interconnected worldwide network, which has been dubbed 'the earth's cardiovascular system'. Magma is said to flow horizontally and vertically through active channels at the rate of a few centimetres a year, and due to the earth's rotation the preferred direction of flow is eastward. Horizontal flow is demonstrated by two major surface features: linear, belt-parallel faults, fractures, and fissures; and the division of tectonic belts into fairly uniform segments. The magma is believed to originate in the asthenosphere, which is generally believed to consist of partially melted rock. Rather than being a global layer, the asthenosphere consists of disconnected zones, extending from about 60 to 150 km in depth.

Interpretations of seismic data generally assume that lower velocities mean higher temperatures while higher velocities mean lower temperatures. For instance, the high-velocity 'roots' of ancient continental nuclei are assumed to consist of cooler rock, while low-velocity zones (such as the asthenosphere) are usually assumed to consist of hotter, perhaps partially melted rock. However, differences in seismic

velocity can also reflect differences in pressures, chemical composition, or mineralogical phases, and it is therefore wrong to assume that *all* low-velocity zones must be areas of incipient melting. V. Sánchez Cela argues that asthenospheric zones are better explained as zones where phase changes are taking place [5].

Drilling tens of kilometres into the crust to check seismic interpretations is technologically unfeasible at present. However, further information on the lower crust and upper 'mantle' could also come from the future discovery of tunnels and caverns extending to 'impossible' depths. The Veronja (or Krubera) Cave in Georgia, Abkhazia, is currently the deepest known cave in the world, with a depth of 1710 metres [6]. South African gold mines are by far the deepest mines in the world, reaching depths of over 2 miles (3.2 km).

Basalts have erupted on earth throughout geologic history, and cover some 63% of the ocean basins and at least 5% of the continents. Giant flood-basalt fields, such as the Deccan Traps in India and the Siberian Traps, have volumes of 100,000 to 10,000,000 km^3. In plate tectonics, flood basalts, large igneous provinces, and all intraplate magmatism are usually ascribed to 'mantle plumes' -- upwellings of hot material allegedly originating at the core-mantle boundary. The movement of plates over the plumes is said to give rise to hotspot trails, i.e. chains of volcanic islands and seamounts. Such trails should therefore show an age progression from one end to the other, but a large majority show little or no age progression. In a detailed critique, H.C. Sheth has argued that there is no geological evidence of any kind requiring mantle plumes, and that the concept is ill-founded, contrived, and invalid, and has led earth scientists up a blind alley. He shows that shallower processes could produce basaltic volcanism [7].

While cylindrical upwellings of mantle material (not necessarily from great depths) might account for isolated volcanoes, they cannot account for the massive ovate and linear flood-basalt provinces found in many parts of the world. Some geologists argue that volcanism in the midocean ridges, linear islands and seamount chains, ocean plateaus, island arcs, and continental interiors is more readily explained by the rupturing of individual or colliding surge channels [8]. V. Sánchez Cela has proposed that the upper mantle is far more sialic than current models assume, and believes that the ultramafic rocks currently assumed to come from the upper mantle, together with their partial melting products (basalts), can be formed in the upper crust in suitable dynamic and chemical conditions [9].

80% of all earthquakes are said to take place in the upper 100 km, while the rest occur at depths of up to 700 km.* Most deep-focus earthquakes occur in Benioff zones, which are probably deep contraction fractures that formed early in the earth's history. Moreover, as mentioned in part 1, such earthquakes suggest the existence of solid, brittle rocks at such depths, contrary to the conventional earth model.

> *It should be noted that all estimates of depth based on the interpretation of seismic data are likely to be wrong if the underlying assumptions concerning the earth's interior are wrong. However, such estimates can be used as a *relative* indication of depth.

Electrical disturbances have been noted both preceding and during earthquakes, volcanic eruptions, and hurricanes. It has been suggested that changes in geoelectric currents may precede major mechanical stress relief that appears afterwards in the

form of an earthquake [10]. In addition to the observation of anomalous earth currents in the vicinity of earthquake epicentres, changes in the magnetic field, both local and global, before, during, and after earthquakes and volcanic eruptions have been observed [11].

In the 19th century, earthquakes, volcanoes, and many other geological phenomena were believed to be caused by great currents of electricity in the earth and atmosphere. Nowadays, electrical and magnetic phenomena have been demoted to mere byproducts of crustal stresses and the movement of internal fluids. Nevertheless, electromagnetic forces may play a far more prominent role in geological activity than is currently believed. Joseph Cater suggests that the fault lines crisscrossing the earth's rocky shell could act as condensers allowing a significant buildup of electric charges, resulting in tremendous repulsive electrostatic forces and explosive discharges when the concentration reaches a critical state. The ensuing stresses and strains and accumulating heat could help to generate pockets of molten rock, and trigger vertical and horizontal crustal movements [12].

If scientific estimates of the temperature far below the earth's surface are grossly exaggerated, the earth's shell may contain far more liquid water than is currently believed. If water (from either surface or subterranean sources) comes into contact with locally superhot rocks, this would have explosive effects. *Etidorhpa* suggests that large quantities of water periodically come into contact with huge deposits of sodium and other metallic bases, and the violent chemical reaction that ensues forces melted rock and steam to the surface, resulting in earthquake or volcanic activity. As indicated in part 1, the movement of subterranean gases might also play an important role in such activity.

In short, none of the geological activity observed at the earth's surface proves the standard earth model or rules out a hollow earth.

Planet formation

Several researchers have suggested that a spinning sphere might become hollow naturally. If the earth was initially in a more molten or plastic state and rotated faster than today, centrifugal forces could have partially counteracted the gravitational force, causing the highest-density matter to migrate to the outer zones, thereby 'hollowing out' the planet's interior.

Scientists believe that stars and planets formed from huge clouds of dust and gas, which condensed into spinning spheres under the force of gravity. John Flora states that such stars and planets should have spun ever faster as they contracted, in accordance with the law of conservation of angular momentum. In reality, however, larger stars spin faster than smaller ones, and in our solar system larger planets spin faster than smaller ones. For instance, the earth rotates in 24 hours, while Jupiter, the largest planet, with a diameter over 11 times that of earth, spins about its axis in just under 10 hours. This is not what we would expect of condensed, solid planets. Flora argues that a high rate of rotation would cause a spherical body to expand until it reaches a point of maximum inertial stability, thereby becoming hollow [13].

Dr Gordeev, a mathematician, argues that if a homogeneous globe begins to spin,

the centrifugal force will cause light elements to move outwards, leaving behind a core at the centre, where centrifugal force is zero. Assuming there is an initial crust, when the light materials reach it, it will become increasingly 'solid', while the rest of the globe becomes 'hollow'. Gordeev disagrees with Flora's argument that some kind of polar holes would be produced during the formation of a hollow sphere [14].

According to theosophy, instead of condensing out of molten physical matter our globe has crystallized out of a more ethereal state of matter, described as 'fiery, cool and radiant'. The Stanzas of Dzyan (6:4) describe in figurative language how 'fohat' -- electric, vital force, guided by the universal mind -- builds planets ('wheels') by generating vorticular motion ('whirlwinds') in the primordial matter or 'fire-mist': 'He collects the fiery dust. He makes balls of fire, runs through them, and round them, infusing life thereinto, then sets them into motion' [15]. The 'germs of wheels' are described as 'centres of force, around which primordial Cosmic matter expands, and, passing through all the six stages of consolidation, becomes spheroidal and ends by being transformed into globes or spheres'. The earth thereby 'passed from a soft plastic body into a rock-bound globe'. The 'rocky crust' or 'body shell' is said to have reached its most material state at the midpoint of our planet's evolution, several million years ago, and has since begun to return slowly to a more ethereal state [16]. At the centre of any globe there is said to be an 'inner kingdom' composed of the lowest of the three kingdoms of elementals (ethereal, submineral nature-forces). The earth's core is described as 'concreted electricity', and is said to be analogous to the nucleus of an atom [17].

Whereas science regards the sun as a ball of plasma, or fourth-state matter, theosophy asserts that the sun's interior consists largely of matter in its fifth, sixth, and seventh states -- states unknown to scientists on earth [18]. It also asserts that sunspots do not prove the solidity of the 'central mass' of the sun, any more than storm clouds prove the solid mass of the atmosphere behind them, and that the sun's visible outer robes of condensed vital electricity merely form an outer shell [19]. According to the scientific model, a photon takes about a million years to travel from the sun's centre to its surface. According to theosophical literature, on the other hand, the sun's energies take only a year to pass through the sun, and there are bodies circling in the interior of the sun, around its core [20].

Although scientists cannot be certain of the real masses and average densities of the planets, they do have a good idea of their *relative* masses and densities. That means that if the earth is hollow, it is highly likely that all the other planets, and also the sun, are hollow as well, otherwise astronomical predictions of celestial motions would fail, and the space programme would be impossible. Even the conventional values for the mass and average density of celestial bodies do not rule out their being hollow, since there could be a super-dense type of energy-substance concentrated at their centres.

Central sun

As far as a hypothetical central sun is concerned, an analogy can perhaps be drawn with the external sun. The theory that the sun is powered exclusively by thermonuclear reactions faces serious problems, the main one being that the sun only

produces about a third as many neutrinos as the model requires. The fact that the sun undergoes periodic fluctuations in output and size is also difficult to reconcile with thermonuclear theory [21].

To account for the neutrino shortage, it has been proposed that electron-neutrinos from the sun change into muon-neutrinos and tauon-neutrinos on their way to the earth, these two neutrino 'flavours' being more difficult to detect. In June 2001 the Sudbury Neutrino Observatory (SNO) in Canada announced that it had confirmed this theory. However, the only way to truly confirm it would be to make neutrino measurements at the sun and at several points between sun and earth. Since the experiments in question only involved measurements on earth, the joyful acceptance of the SNO's pronouncements by other mainstream scientists merely confirms how uncritical and unprofessional they can be when orthodox theories are at stake [22].

Harold Aspden is one of the scientists who rejects the hypothesis that the sun derives its power from fusion of colliding protons in its allegedly super-hot interior. He argues that gravity close to the sun's surface squeezes hydrogen atoms so close together that they ionize. And since the gravitational interaction between two free protons is 1836 times greater than that between two free electrons, the net repulsion of the protons in the sun's interior balances gravitational forces and prevents further compaction. As a result the sun has a uniform mass density and temperature that is insufficient to trigger fusion - 'and if it were,' says Aspden, 'the sun would have been blown to pieces long ago'! He continues:

> The energy the sun radiates is sustained because free electrons recombine with protons and when they do, this imports energy from the quantum underworld (the aether) to get those electrons back into their quantum state orbits. The sun's energy is not fusion energy but simple energy drawn from the aether by gravity squeezing hydrogen atoms close together to cause ionization. [23]

Paul LaViolette argues that the cores of both planets and stars produce what he calls 'genic energy', because they are supercritical regions of space where photons draw energy from the underlying ether. He argues that 15% of the sun's energy could be supplied by genic energy, while the rest comes from nuclear fusion. He shows that the sun and low-mass stars (red and brown dwarfs) have the same mass-luminosity relation as the four gas giants (Jupiter, Saturn, Neptune, and Uranus), suggesting that they are powered chiefly by the same energy generation mechanism. He maintains that genic energy can account for 73% of the earth's entire thermal output, including all of the core heat flux. This would render unnecessary the current speculations that this heat comes from the gradual release of heat trapped since primordial times, or from the gradual solidification of a molten core, or from radioactive decay [24].

Jones et al. have proposed that cold nuclear fusion might be an important source of the heat emanated by the earth [25]. They argue that the fusion of deuterium and hydrogen deep within the earth would explain the high levels of helium-3 found in rocks, liquids, and gases from volcanoes and in active tectonic regions of the earth's crust. They point out that Jupiter radiates twice as much heat as it receives from the sun, and suggest that the excess heat could come from cold fusion in Jupiter's core,

which is believed to consist of metallic hydrogen together with iron silicates. LaViolette argues that while cold fusion might be feasible for planet-sized bodies, stars would exhaust their deuterium supply within a few million years due to their much higher luminosities, so that cold fusion does not explain why the planets share a common mass-luminosity relation with lower main-sequence stars.

That there may be unrecognized sources of radiation deep within the earth is shown by the phenomenon of 'anomalous cascades' -- huge showers of nuclear particles that have been measured in a deep mine coming from the sides and even from below. Neutrinos are the only known particles capable of penetrating the entire earth to create the upwardly directed showers, but ordinary neutrinos from the sun do not seem to have enough energy to produce them [26].

Alchemy

On the question of what powers the stars, G. de Purucker writes:

> the interiors of the various suns are not at all existing in conditions of incomprehensibly intense heat, although it is probably true enough that the outermost ethereal layers of the suns possess a certain amount of heat of their own, as a result of chemical processes. The heart of any sun is a most marvellous alchemical laboratory in which occur molecular, atomic, and electronic changes which it would be utterly impossible to reproduce in any of our chemical workshops. [27]

He states that although some degree of atomic dissociation may be taking place in the sun, this does not explain the origin of the energies that it ceaselessly emanates. Every star, he says, is 'the outward vehicle of an indwelling spiritual and intellectual presence'; at their core resides 'a divine monad of stellar origin and character'. And this solar logos or 'god' should not be thought of as being solely at the core of the physical sun, but rather as being in the invisible astral, mental, and spiritual realms of the sun [28]. Purucker is here voicing a central tenet of the ancient wisdom: that every physical organism is the outer manifestation of a series of inner 'energy fields' or 'souls' of increasing subtlety and power.

On earth, too, a series of chemical and alchemical processes are said to be constantly in progress, which differ from those taking place in stars and nebulae only in degree.

> The interior of the Earth is another of Nature's marvelous laboratories wherein wonderful and to us men almost unknown things are constantly happening; and, indeed, the same may be said of the unceasing laboratorial work of Nature in the higher and highest ranges or strata of the Earth's atmosphere, and its unceasing interplay of forces and substances with the fields of outer space, whether this be done through the medium of radiation of various kinds, or partly by radiation and partly by as yet undiscovered natural means. [29]

Modern science is often inclined to adopt a sledgehammer approach in its study of nature. For instance, physicists widely believe that by smashing subatomic particles

together at ultrahigh energies in particle accelerators and then studying the debris, they will be able to wrench from nature some of her deepest secrets! It is also commonly believed that nuclear fusion, whereby light elements combine into heavier ones, can take place only at temperatures of millions of degrees, such as are thought to exist in stars. Yet numerous experiments have shown that anomalous excess heat can be produced by a variety of poorly understood nuclear reactions, possibly involving fusion, at low temperatures and in relatively simple devices, instead of in reactors costing millions of dollars. 'Cold fusion' has generally been derided by the scientific establishment [30], though as noted above, some scientists have speculated that it may be taking place within the earth and other planets.

Biologist Louis Kervran and a number of other researchers have demonstrated that, in plants, animals, humans, and even minerals, common elements can be transmuted into heavier or lighter elements without the need for extremely high temperatures and pressures [31]. These transmutations are often reversible, and most involve hydrogen, which has 1 proton ($_1$H), or oxygen, which has 8 ($_8$O). Examples are:

$_{11}$Na + $_8$O --> $_{19}$K (Na = sodium; K = potassium)

$_{19}$K + $_1$H --> $_{20}$Ca (Ca = calcium)

$_{12}$Mg + $_8$O --> $_{20}$Ca (Mg = magnesium)

$_{14}$Si + $_6$C --> $_{20}$Ca (Si = silicon; C = carbon)

$_{25}$Mn + $_1$H --> $_{26}$Fe (Mn = manganese; Fe = iron)

Mainstream scientists dismiss the possibility of such alchemical transformations, as they believe that protons and neutrons can only be added to or removed from atomic nuclei by violent methods and under extreme conditions. But nature can apparently accomplish such things by gentler means as well.

A reviewer of one of Kervran's books wrote:

> Hundreds of experiments in reputable laboratories undoubtedly demonstrate that transmutations of atomic nuclei occur in living matter. It may be impossible, but it seems to happen. Sodium changes to potassium, calcium to potassium and vice versa. In certain cases silicon plus carbon gives calcium. Nitrogen is transformed to carbon monoxide. All of which is quite contrary to all know natural laws; but the experiments exist, and I know of no serious refutation of them. [32]

In 1959, French chemist Pierre Baranger stated that, after many years of experiments, 'we have to submit to the evidence: plants know the old secret of the alchemists. *Every day under our very gaze they are transmuting elements*' [33].

Kervran argued that the occurrence of low-energy transmutations, sometimes with the help of bacteria, helps to explain the origin of metals and the composition of successive geological strata.

In a series of experiments with seedlings placed in air-tight glass vessels, Rudolf Hauschka found that their mineral content both increased and decreased, and he concluded that plants could not only transmute physical substances, but could also generate physical matter out of the ether and dematerialize it again. He noted an

emergence and disappearance of matter in rhythmic sequence, often in conjunction with the phases of the moon [34].

It would seem that no model of the earth and its evolution can be correct or complete if it ignores the evidence for subtler states of matter and alchemical transmutations.

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Mysteries of the Inner Earth: Part 3

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David Pratt

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1. The open polar sea

Many 19th-century explorers believed that beyond the belt of pack ice at the perimeter of the Arctic Ocean there was an open polar sea, and possibly continental land as well. The idea of an open polar sea took a long time to dispel, but we now know that there is no iceless ocean beyond 80°N. However, polynyas, temporary areas of ice-free water, occur in both the Arctic Ocean and the Southern Ocean surrounding Antarctica, and are not yet fully understood. Some are 160 km across, and the largest may cover as much as 300,000 sq km, implying a substantial influx of heat [1].

In 1827 an expedition led by Edward Parry ventured far north of Spitzbergen, over ice and along leads of open water. As they sledged north, the ice-field became lighter and more fissured, and they eventually found themselves on the edge of what seemed to be a vast open polar sea, containing only a few scattered pieces of ice. They reached 82°45'N, a record that was unbeaten for half a century. In 1853 Elisha Kent Kane mounted an unsuccessful attempt to reach the north pole via Smith Sound separating Greenland from Ellesmere Island. The same route was attempted in 1861 by Isaac Israel Hayes, who sledged just beyond 80°N. Both expeditions mistook an

area of open water for an open polar sea. The first man to reach the edge of the Arctic Ocean was another American, Charles Francis Hall. In 1871 he sailed up the channels leading from Baffin Bay to the Arctic Ocean and reached 82°11'N. Hall died after his ship was hit by a floe.

While attempting to reach the north pole in 1871-73, two young Austrian explorers, Karl Weyprect and Julius Payer, discovered the islands of Franz Joseph Land and came to believe that they were the outliers of a continental landmass. Lieutenant George Washington De Long hoped to find this land. In 1879 he sailed in the *Jeanette* through the Bering Straits into the Arctic Ocean, planning to take advantage of the warm, north-flowing currents which he believed would open a way through the pack ice. However, in June 1881 his ship sank in the pack ice northeast of the New Siberian Islands, a tragedy which De Long and many of his men did not survive.

Three years after the *Jeannette* had sunk, debris and scraps of clothing that had littered the floe near the grave of the ship were found embedded in the ice that had been washed ashore in southwest Greenland. This gave the Norwegian polar explorer Fridtjof Nansen the idea for the epic drift of the *Fram* across the Arctic Ocean, from June 1893 to August 1896. The plan was to drive his specially designed ship into the pack ice in the vicinity of the New Siberian Islands and drift with the currents across the Arctic Ocean towards the Greenland Sea. The *Fram* drifted across the Polar Basin, but as time went on it became clear that it would not drift over the pole but would bypass it. Nansen and Johansen left the ship to make a dash for the pole across the ice floes with sledges and dogs. They left the *Fram* in latitude 84°N in March 1895. In just under a month they reached their farthest north of 86°13', from where the northern prospect was 'a veritable chaos of iceblocks'. They then made their way over treacherous ice to Franz Joseph Land, some 400 miles to the southwest, averaging less than 5 miles a day. Nansen was eventually reunited with the *Fram* at Tromsö in August 1896.

The famous British explorer Wally Herbert writes:

> [Nansen's] expedition, in the teeth of scepticism and discouragement, had drifted with the shifting expanse of polar ice across an unknown ocean -- a courageous voyage inspired and conducted with consummate intelligence -- a saga that will never be surpassed. [2]

The expedition found neither land nor an open polar sea. They frequently encountered large stretches of open water, and the weather conditions together with the wildlife and its direction of travel sometimes made them suspect there might be land in the region of the north pole. However, their final conclusion was that the existence of a considerable expanse of land beyond 86°N was highly unlikely.

Figure. Arctic exploration [3].

Some of Nansen's experiences during his arctic voyage in the *Fram*, as described in his book *Farthest North* (1898), have become an integral part of hollow-earth lore. Gardner and Reed and many later writers claim that Nansen travelled a considerable distance into the northern polar opening without realizing it. However, Nansen could not have entered the interior without passing a point on the earth's surface that gave a false impression of 90° latitude -- i.e. of being at the north pole -- and there is no evidence that the *Fram* ever reached such a point. Gardner makes a lot of the fact that after leaving the ship for the abortive attempt on the pole, Nansen was completely lost for many months. He insinuates that this was because the curvature of the earth was different to what was expected due to the fact that Nansen was on the lip of a polar opening. However, Nansen's difficulty in finding Franz Joseph Land was largely due to the fact that he and Johansen had carelessly let their chronometer watches run down, with the result that all their calculations for longitude were out by several degrees.

The arctic climate appears to have varied markedly during the past 2000 years, partly reflecting global trends. For instance, the climate appears to have been much milder from the 5th to 11th centuries, with less permafrost and sea ice [4]. Historical reports indicate that the winter of 1476-77 in Iceland was extremely mild, supporting

Christopher Columbus' disputed claim that he found the ocean there to be relatively ice free at the time. The climate subsequently cooled, but Iceland has also had mild winters in more recent times. Weather reports indicate that between 1800 and 1883 there were 20 winters during which no pack ice came down from the polar ice cap north of Iceland [5]. But none of this requires a belief in warm air and ocean currents emerging from a polar hole!

2. The north pole controversy

Commander Robert E. Peary (1856-1920) was obsessed by the ambition to be the first man to reach the north pole. His final attempt on the pole was undertaken at the age of 53, after 23 years of arctic exploration (on one of his expeditions he had to have seven of his toes amputated due to frostbite). He set out from Cape Columbia on the north coast of Ellesmere Island on 22 February 1909, and claimed to have reached the north pole on 6 April 1909. However, just before Peary's return to the United States in September 1909, Dr Frederick A. Cook (1865-1940), a respected American explorer who had been with Peary in Greenland in 1891-92 and who had spent 1907-09 in the Arctic, announced that he had reached the pole the year before with two Eskimos, from the north point of Axel Heiberg Island. The *Encyclopaedia Britannica* comments:

> The matter aroused considerable controversy, which is still very much alive. There are grounds for serious doubts as to whether either man reached the pole, since neither was able to produce conclusive evidence to support his claim.[1]

Richard E. Peary. **Frederick A. Cook.**

The problems with Peary's claim are his very high sledging speeds and his very slack navigation. Peary covered the final leg of 130 nautical miles (nmi) in five marches of 26 nmi each on his outward journey, and in three marches of 43.5 nmi each on his return journey. Peary supporters try to show that these incredible speeds

are not impossible by pointing to the successful 1986 polar expedition led by Will Steger. Steger achieved an average speed of 21.7 nmi per day, and even managed 32 nmi in half a day [2]. However, when Steger reached the pole on 1 May 1986, he had few rations, having abandoned most of them to lighten his load, and was airlifted out. He could not have returned to his starting point on what remained, whereas Peary had to carry everything he needed for his round trip. No one has ever reached the north pole and returned to their point of departure as fast Peary allegedly did [3]. This fact undermines the claim of some hollow-earthers that Peary's high sledging speeds were due to the anomalous curvature of the earth in the region of the supposed polar opening.

Peary claimed to have followed a 660 km straight line from Cape Columbia along the 70°W meridian to the pole. His last recorded observation of the sun was at a distance of six travelling days or 220 km from the pole. From here he was accompanied solely by the black explorer Matthew Henson (his manservant) and four Eskimos. He claimed to have travelled the last distance at a faster pace than at any time previously and to have done so without any navigational aids other than 'dead reckoning', which means maintaining your direction forward by observing your track behind. The problem is that the arctic ice is always shifting and moving with the wind and currents. Wally Herbert asks: 'What then gave him the crazy idea that he could strike out across the drifting pack ice, and without any observations for longitude or any checks on the variation of the compass, could aim for and hit the Pole?' [4].

Peary asserted that he had observed the sun from the pole to establish his position, but the observations were not recorded in his diary but on a piece of paper inserted into the diary at that place. Herbert believes Peary probably got little further than 89°. The pages of Peary's diary for 6 April (when he claimed to have reached the pole) and the succeeding two days, are uncharacteristically blank. Herbert believes Peary was then wrestling with a major dilemma. He had to choose 'between admitting that he had gone in the wrong direction and had failed to reach his goal, or looking back along the trail at all those years of suffering and convincing himself that he had earned the right to claim it' [5].

Frederick A. Cook claimed to have reached the north pole on 21 April 1908. He left the last Eskimo village in Greenland in February 1907, and for his assault on the pole he was accompanied by just two Eskimos, Etukishuk and Ahwelah. He stated that on his return journey he had drifted off course and was prevented from reaching his food caches on the mainland. He was forced to spend a winter in the Canadian Arctic, before undertaking a circuitous and difficult sledge journey back to Greenland.

Cook's claim to have been the first man to reach the pole was immediately challenged by Peary but initially won wide acceptance. However, the Peary Arctic Club launched a vigorous campaign to discredit him. They published an article based on interviews with Etukishuk and Ahwelah conducted by several of Peary's men, including Henson and Donald MacMillan. The Eskimos were quoted as saying that they had never ventured far into the polar ocean, and had camped out on the polar ice for several days before returning to land. Cook's claim to have been the first man to reach the summit of Mt McKinley, the highest mountain in North America (20,320 ft/6194 m), in 1906 also came under attack. Ed Barrill, the man who had accompanied

Cook to the top, now confessed that they had never been anywhere near the summit, and that the supposed photograph of the summit published in Cook's book had been taken far lower down.

Far more damage was done to Cook's reputation, however, when a committee at the University of Copenhagen, to which Cook had submitted some of his original field notes, ruled that they were not sufficient to prove that he had reached the north pole. The American press proceeded to denounce Cook as 'one of the most monumental impostors of history'. Meanwhile, a committee of the National Geographic Society, composed entirely of Peary's admirers, had endorsed Peary's claim to have discovered the north pole. However, not everybody was satisfied. In 1911 his proofs were examined by a Congressional subcommittee. Although it endorsed his claims by four votes to three,

> Peary's testimony before Congress was full of prevarications, contradictions and incredible lapses of memory on crucial points. It was a disaster for Peary, and it set in motion all the doubts that plague his claim to this day. [6]

One of the subcommittee members denounced him as a 'wilful and deliberate liar' and a 'contemptible little ass'!

After a year of self-imposed exile, Cook proceeded to tour Europe and America in an effort to win back public support. He ridiculed Peary at every opportunity, even calling him a 'leprous blot on the fabric of clean human endeavor'. Although public interest in the controversy eventually died out, heated debate between Cook partisans, Peary partisans, and those who are partisans or detractors of both has continued to this day. Cook's advocates, who include several world-class explorers and geographers, describe him as 'the most defamed man in arctic history'.

Regarding the Mt McKinley controversy, Cook's defenders point out that the Peary Arctic Club is now known to have paid Barrill $5000 for his 'confession', and maintain that Cook's descriptions of features at the highest elevations of the mountain indicate that he must have been there. They concede, however, that most if not all of the photographs in Cook's book *To the Top of the Continent* (1908) were not in fact taken high on the mountain as the captions declared, but they claim that Cook used them as substitutes because he failed to take good, clear photos at the highest altitudes. It does seem rather implausible, though, that he just happened to have photographed features suitable for 'illustrative purposes' even before the real ascent had begun. Moreover, there are important discrepancies between Cook's original diary of his climb (which he never submitted for examination) and his published accounts, as if his story was still evolving [7].

Regarding the Eskimo testimony against Cook, Cook's defenders point out that about 35 polar Eskimos were interviewed by the Danish explorer Knud Rasmussen in the summer of 1909, before Peary returned from his attempt on the pole, and they testified that Etukishuk and Ahwelah had told them that they had travelled over the pack ice with Cook for weeks and had reached the 'Great Nail' (north pole). A year later, however, Rasmussen retracted his report because the two Eskimos had allegedly told a Danish missionary that they did not in fact go all the way to the pole.

Peary's supporters issued conflicting statements regarding the testimony of Etukishuk and Ahwelah. It is quite possible that they had misunderstood or misrepresented what the two Eskimos had said, or that the latter had modified their story in order to pacify Peary. So Cook may have travelled further over the pack ice than Peary's followers claimed. But it is noteworthy that the stories handed down among the Eskimos to this day do *not* support Cook's claim to have reached the north pole [8].

Cook's description of physical conditions and natural features at the north pole and in the region the Central Arctic Basin through which he sledged is said by his supporters to have been confirmed by later exploration in detail after detail, proving he must have come close to the pole [9]. Sceptics, on the other hand, argue that Cook's description of the pack-ice conditions and the drift of the ice near the pole could have been an informed guess based on what he and other explorers had found less far to the north.

As regards the judgement by the University of Copenhagen, Cook's defenders point out that the records submitted by Cook were indeed incomplete, but that this was because while he was in Greenland he had given the rest to Harry Whitney, who was supposed to bring them with him to the US on Peary's vessel. Peary, however, had ordered Whitney to leave behind anything belonging to Cook. Interestingly, Cook never tried to retrieve his records. Indeed, he stated privately that he had copies of them and that they did not contain anything that would prove his claims, though this was not the impression he gave the University of Copenhagen. He admitted to being very happy with its open verdict. There is strong evidence that Cook's navigational abilities were grossly inadequate. He did not submit any of his observations for latitude and longitude to the Danes, though he did include some observations in his book a few years later. However, they contained errors, which were corrected in subsequent editions [10].

All but one of Cook's original notebooks have since come to light. Robert Bryce argues that a careful study of them reveals why he did not want anybody to see them all. They contain various changes to dates, distances, and latitudes, are inconsistent, and differ on important points from his published accounts of his trip, showing how he gradually improved his story. Cook's speeds are also difficult to credit. He claimed to have travelled the 520 miles from Cape Thomas Hubbard to the pole at a rate of 15.3 miles per day. When detours are allowed for, his speed must have averaged 23 miles per day for 34 consecutive days. If we ignore Peary's claims, no dog sledge journey to the pole ever since, even ones that were resupplied on route, has approached anything like such a speed. Bryce concludes from Cook's records that he did make an honest attempt at the pole, but turned back after advancing about 92 miles over the treacherous pack ice [11]. With his gentle, self-assured manner and never-failing smile, Cook then proceeded to 'deceive millions magnificently'. In 1911, one of Cook's former supporters wrote: 'Let us draw the mantle of charity around him and believe, if we can, that there is a thread of insanity running through the woof of his brilliant mind' [12].

Controversy surrounds not only the question of who was the first person to reach the north pole on foot, but also who was the first to fly there. The Americans Richard E. Byrd and Floyd Bennett claimed to have made the first airplane journey over the north

pole on 9 May 1926, flying from their base in west Spitzbergen to the pole and back. Like Peary, they were acclaimed as national heroes. However, some doubt always lingered over whether their plane had actually reached the north pole. In 1996 the diary that Byrd had kept on his famous flight was discovered, and some researchers think that his diary entries suggest the airplane was still about 150 miles (240 km) short of the north pole when Byrd decided to turn back because of his concern over an oil leak [13]. Three days after Byrd's flight, Roald Amundsen of Norway, Lincoln Ellsworth of the United States, and Umberto Nobile of Italy flew over the north pole in a dirigible, on their transarctic flight from Spitzbergen to Alaska.

Since then, the north pole has been reached many times. The first landing made by an aircraft at the pole was in 1937 when a Soviet team was landed there to set up a scientific drifting station. In August 1958 the nuclear-powered submarine the *Nautilus* made a historic underwater cruise from Point Barrow, Alaska, to the Greenland Sea, passing completely beneath the ice cap of the north pole. The first surface vessel to reach the pole was the Soviet nuclear icebreaker *Arktika*, which approached from the direction of the New Siberian Islands. The first surface expedition confirmed as having reached the pole was an American expedition under Ralph Plaisted, which reached it from northern Ellesmere Island by snowmobile in 1968. The following year the British Transarctic Expedition, led by Wally Herbert, was the first to reach the pole by dog team while en route from Point Barrow to Spitzbergen.

There can no doubt that the earth's north geographic pole *does* exist on the earth's outer surface rather than being an imaginary point in the middle of a huge polar hole.

3. Polar land coverup?

Early arctic explorers reported seeing birds and animals moving north as winter was setting in, instead of going south, and inferred that they were heading to a warm land in the north. Peary once experienced a heavy fall of black dust in Greenland and thought it may be volcanic dust from unexplored land to the north. In 1904 Dr R.A. Harris of the US Coast and Geodetic Survey published an article explaining why he believed that there must be a large body of undiscovered land or shallow water in the polar basin northwest of Greenland. He argued that the prevailing currents seemed to indicate their deflection by an unknown landmass lying in this approximate area, that the Eskimos living on the northern fringes of the Arctic Ocean had a tradition that a landmass existed to the north, and that the disruption of the tides north of Alaska indicated a moderating effect explainable by intervening land [1].

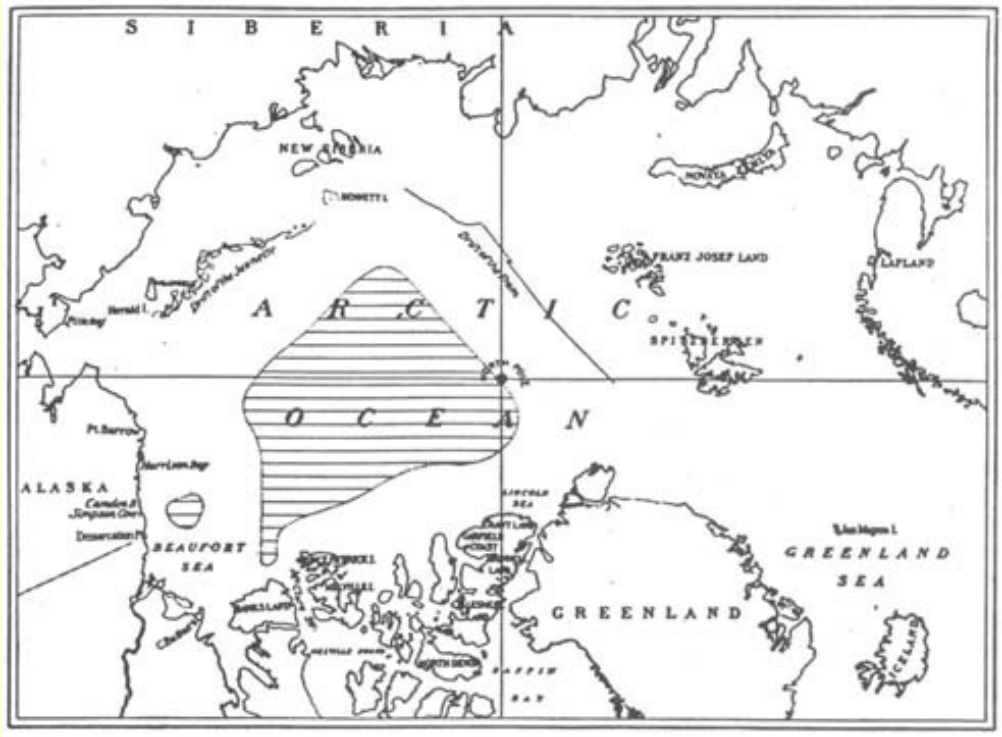


Figure. R.A. Harris' 1904 map showing hypothesized land near the pole [2].

Various arctic explorers actually reported seeing land in the distance, though it should be noted that visibility can be very poor, and mirages are very common. In 1811 Jakov Sannikov reported that he had seen a vast land to the northwest of the New Siberian Islands; it was named Sannikov Land. E. Moll claimed to have seen it twice, in 1886 and 1893, and it was marked on maps. Nansen did not find Sannikov Land during his expedition, nor have any later expeditions found it, and it is now thought to have been an ice island. Eskimos in Alaska have sometimes reported seeing hilly land to the north in the bright, clear days of spring. Land in this vicinity was seen by Captain John Keenan and his crew in the 1870s [3]. However, no such land has been discovered.

Crocker Land

Another famous disappearing land is Crocker Land, 'discovered' by Peary. He first saw it on 24 June 1906 from the top of a 2000-ft mountain situated behind Cape Colgate in northern Greenland. He wrote: 'North stretched the well-known ragged surface of the polar pack, and northwest it was with a thrill that my glasses revealed the faint white summits of a distant land which my Eskimos claimed to have seen as we came along from the last camp.' A few days later, on 28 June, Peary was at Capt Thomas Hubbard at the northern tip of Axel Heiberg Island. It was a clear day and, from the top of a 1600-ft hill, Peary says that through his binoculars he was able to 'make out apparently a little more distinctly, the snow-clad summits of the distant land in the northwest, above the ice horizon'. At both locations Peary built cairns in which he left a brief record.

Peary estimated that Crocker Land lay 120 miles from the northern coastline of Axel Heiberg Island. In 1914 his friend, Captain Donald B. MacMillan, led an expedition to find it. On 16 April he left Cape Thomas Hubbard with Ensign Fitzhugh Green and two

Eskimos, Pewahto and Etukishuk. They trekked out onto the frozen polar sea, bypassing many leads of ice-free water. By the evening of 21 April they were nearly 100 miles from shore, yet nothing was in sight on the horizon, even though the mist had cleared. The next morning, however, MacMillan was inside their igloo when he heard Green shouting excitedly that Crocker Land was in sight. In his diary he wrote:

> We all rushed out and up to the top of a berg. Sure enough! There it was as plain as day -- hills, valleys, and ice cap -- a tremendous land extending through 150 degrees of the horizon. We had even picked out the point to head for when Pewahto remarked that he thought it was mist . . . resembling land. As we watched it more narrowly its appearance slowly changed from time to time so we were forced to the conclusion that it was a mirage of the sea ice. This phenomenon has fooled many and many a good man . . . [4]

They thought they could see land again in the morning of the 23rd, but it had faded away in the afternoon when the sun worked south and west. Though they advanced a total of nearly 150 miles, they found no land, and MacMillan concluded: 'my dream of 5 years is over.'

After returning to shore, the party found one of Peary's cairns and retrieved his message. Although he had seen Crocker Land from this spot, the record read simply: 'Peary, July 28, 1906.' MacMillan looked out to sea and thought he could see land as well. He believed that if he had been there in Peary's place, he would have declared the discovery himself. Later, Peary's other cairn was discovered. The message it contained stated that on the day Peary claimed to have first seen Crocker Land he had 'a clear view of the northern horizon', yet there was again no mention of land.

Wally Herbert draws attention to the fact that Peary's diary entries for both days also make no mention of his discovery of new land to the northwest. Nor do the telegrams he sent out on his voyage home informing his sponsors of his achievements. Only in his book *Nearest the Pole*, published in 1907, did he mention 'Crocker Land', which he named after one of his financial backers. Herbert thinks that both Crocker Land, and his highly dubious claim to have set a new 'farthest north' on the same expedition, may have been forced upon Peary by his desperate need to be given one final chance to reach the north pole [5].

Bradley Land

Frederick A. Cook stated that on his journey to the north pole in 1908, he looked for Crocker Land but did not find it at the location given by Peary. However, he said he had seen a mountainous, ice-clad land slightly further from shore, which he named Bradley Land. He saw it to the west of his line of march north across the pack on 30 March 1908, and again on 31 March. It extended from 83°20'N to 85°11'N and was located at about 102°W longitude. It appeared to consist of two islands, and had an elevation of about 1800 feet at its highest points [6].

Later exploration has not found any land at that location. However, in the late 1940s aerial reconnaissance did reveal a number of large 'ice islands' -- breakaway pieces of the ancient ice shelf -- drifting slowly clockwise in the arctic basin north of Ellesmere

Island. Several arctic researchers have suggested that Cook may have mistaken one for land. However, ice islands are much smaller than the features Cook described, and only rise about 25 feet above sea level. Some Cook partisans therefore claim that the ice island Cook saw was not 40 miles away, as he thought, but only 2 miles away, but since Cook claims to have seen Bradley Land in clear weather, this is unconvincing.

One thing is certain: the photograph of Bradley Land that Cook included in *My Attainment of the Pole* (1911) does not show an ice island but real, ice-clad land. Cook supporters tend to agree, but say that, as with some of the Mount McKinley photos, Cook may have used a photograph of a body of land resembling what he had seen as a substitute for the actual but probably poor-quality photo! Others, like Wally Herbert, see the photo as evidence that Cook faked his north-pole journey [7]. Cook's Eskimo companions are reported to have stated that Cook had not seen Bradley Land and that the photograph in his book was taken off the northwest coast of Axel Heiberg Land.

Prior to his attempt at the pole, Cook had expressed the common belief that land would be found in the Arctic Ocean. He said it was reasonable to expect some rocky islets north of Greenland, perhaps extending as far as the 85th parallel, and that any land would probably have an elevation of at least 1000 feet. His faith in Harris's 1904 paper on the likelihood of a polar continent was probably reinforced by Peary's claim of seeing Crocker Land. It seems that Cook took a calculated gamble by claiming to have seen Bradley Land and marking its location on his map. On his return journey, he supposedly came to within 11 miles of Bradley Land, yet he said he had not see it, though his Eskimos had seen it while he was asleep. But he did not make any effort to reach it and confirm its existence [8].

As evidence of how Cook's story evolved, it is worth nothing that, in contrast to his later book on his polar expedition, he stated in one of his notebooks that he *did* in fact see Crocker Land, on 30 March 1908, and he even gives a detailed description. He also stated that he first sighted Bradley Land on 4 April, rather than 30 March, and that on his return journey he saw both Crocker Land and Bradley Land [9]!

Cook asserted that he encountered an island of old, glacial land ice between 87° and 88° N, only 120 miles from the north pole, and travelled over it for portions of two days. He was astonished to discover this island of ancient glacial ice so many hundreds of miles from land. Although it is now known that drifting islands of old glacial ice do exist in the region of the higher Arctic, Cook's photograph of the glacial land ice has proven fraudulent. Wally Herbert discovered that Cook did not print the entire plate in his book. In the Cook Collection at the US Library of Congress, he found an uncropped lantern slide that shows an enormous piece of rock on the right-hand side of the ice. In other words, the glacier is visibly resting on dry land of unknown extent, yet Cook made no mention of this.

Since there is no known land close to the north pole, Herbert and others regard the photo as further evidence that Cook was a liar [10]. The incriminating lantern slide was originally discovered back in 1913 by Evelyn Briggs Baldwin, and led him to renounce his belief in Cook [11]. Cook supporters, on the other hand, trot out their familiar argument that Cook must have used a substitute photograph for 'illustrative purposes'! In his book, Cook expressed uncertainty as to whether the glacial island was floating

ice or was resting on land beneath sea level. This may have served as a hedge that some such feature might be discovered, since this part of his route lay across the zone Harris thought might hold an unknown continent.

A mega-conspiracy?

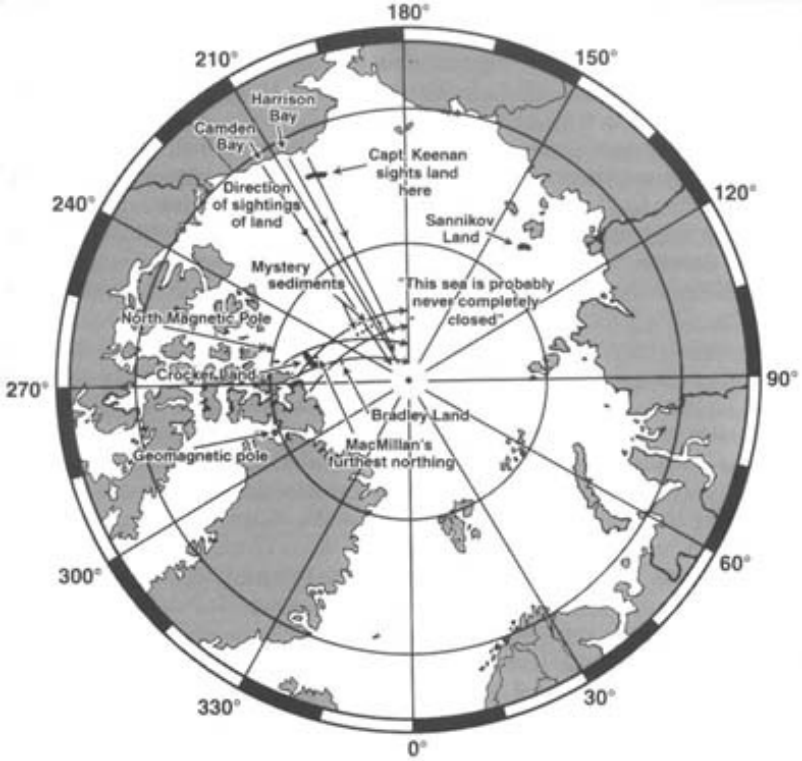
Jan Lamprecht takes quite a different view of Cook and Peary and the controversy surrounding them. Despite all the evidence against them, he believes that they were both perfectly honest, though he admits that Peary's sanctioning of a campaign of vilification against Cook is inexcusable. He believes that both reached the north pole, that their sightings of Bradley Land and Crocker Land were genuine, and that Cook's photo of Bradley Land is authentic. To salvage their reputations, however, he has to invoke a conspiracy of incredible proportions. He argues that one or more polar lands in the north polar region have in fact been discovered -- not where Peary and Cook thought they were, but north of Alaska, some 5° short of the north pole -- and that they lie near or just within a polar opening measuring 100 or 200 or more miles across. He claims that the military and government authorities of Russia, America, Canada, and perhaps other nations have perpetrated an unprecedented coverup to hide these revolutionary discoveries [12]!

Lamprecht argues that the 'land' seen by MacMillan and his men in 1914, with its snow-capped peaks, white summits, and undulating landscape, was not a mirage of sea ice but a 'telescopic mirage' of an enormous polar land in the mid-Arctic lying about 250 to 350 miles from where it was sighted. He also argues that Peary's sightings of Crocker Land were telescopic mirages of the same landmass, dismissing the evidence that he made the story up. On rare occasions, the atmosphere can in fact behave like a telescope. For instance, in 1939 a captain of a schooner and his crew saw landmarks of Iceland as though at a distance of 25-30 nautical miles instead of the actual 335-350 statute miles [13].

Mirages are very common in the Arctic, and frequently involve multiple images lying above the object producing the mirage. These images are usually distorted and upside-down but sometimes the topmost image is the right way up, though it may be vertically compressed. However, neither Peary nor MacMillan saw an inverted image. Lamprecht suggests that the land in question may lie on the inward-curving surface of a polar opening, and that from Peary or Macmillan's vantage point the lower (inverted) image was blocked by the sharp curvature, even though it was seen from locations over 100 miles apart. To explain the enormous lateral extent of the mirages seen by MacMillan (though apparently not by Peary), Lamprecht speculates that the land had been magnified horizontally. Nevertheless, for the mirage to extend over a third or more of the horizon, without any noticeable degradation in brightness, the land itself would still have to be enormous.

Lamprecht believes that Cook's photo of Bradley Land may also be a telescopic mirage, probably of the easternmost extension of Crocker Land, which he thinks is located on the earth's outer surface, but is being covered up because it lies too close to the polar hole. He thinks that Keenan Land could also be a telescopic mirage of the same gigantic polar continent (seen at a distance of over 900 miles!), but that this is probably not true of Sannikov Land given the direction in which it was sighted. He believes that Sannikov Land may lie further away than was originally thought and that

the Russians may be keeping it under wraps because it lies too close to the polar hole (though this is difficult to understand from his map -- see below) [14].



The Missing Polar Continent
Artist: Billy Baty

How plausible are such stories of a vast, international, perfectly leak-proof conspiracy to conceal the existence of a polar land, a polar opening, and a hollow earth? Given the widespread belief in the possibility of a large polar continent in the early 20th century, if any land *were* sighted why would it immediately have been hushed up? After all, if it were lying half-within a reasonably large polar opening, this unexpected fact would not be immediately obvious, and it is hard to see why the military would immediately impose total secrecy.

Despite the large number of military and government personnel -- from several different countries -- who, over the years, must have been involved in perpetuating the alleged coverup and secretly exploring the supposed polar land(s) and opening, and perhaps even the earth's interior, not the slightest leak has ever taken place. And despite the fact that some of the countries involved were enemies during the Cold War, there have apparently been no territorial disputes and no wars over the inner world's resources. Such a conspiracy seems rather unlikely.

Lamprecht believes the polar land and hole might have been discovered in 1926, when Amundsen, Ellsworth, and Nobile made their transpolar flight from Spitzbergen to Alaska. But instead of publicizing their discoveries, they supposedly went straight to the military, and were sworn to secrecy. And even when a bitter dispute broke out between Amundsen and his Italian pilot, Nobile, over credit for the flight, neither of them broke the silence about the supposed discovery of a polar hole.

It is interesting to note that the British Transarctic Expedition from Point Barrow in Alaska to Spitzbergen from February 1968 to April 1969, led by Wally Herbert, passed very close to the spot where Lamprecht places his hole. Lamprecht suggests that Herbert's slow speed may have been caused not by the need to make detours around pressure ridges, but by the need to make a detour around a polar opening. He even implies that Herbert is involved in a campaign of 'sophisticated deception' to conceal the hole's existence, and suggests that Herbert's 'nasty hatchet job' on Cook and Peary is aimed at discrediting the evidence for Crocker Land and Bradley Land. Needless to say, Lamprecht does not have a shred of concrete evidence to support this wild accusation.

If there *is* any land or a polar opening in the region of the north pole, they would surely interfere with the drift of the pack ice. In this regard, Wally Herbert makes an interesting observation about his experience on the Transarctic Expedition:

> We began to feel there must be some obstruction along the imaginary line which describes a circle around the Pole at a radius of 260 miles -- a hump, perhaps, over which ice drifting north could not pass. No less than four times since the end of October [1968] we had drifted towards 86°N, coming at one time to within an hour's walk of that imaginary obstacle -- only to slip back again to 85°30'N, the latitude at which we had moved our hut after the first winter floe had broken up. We had hoped to establish our winter quarters at latitude 88°N, and be carried by the trans-polar drift stream across the Pole. Had this plan materialized, it would have left us with less than 600 miles to sledge to make landfall on Spitzbergen. But we had failed to get farther north than 85° before we had had to turn back and return to our summer floe. And the winter drift, which we had expected to transport us to latitude 87°N, longitude 140°W by 1 March 1969, had instead carried us 130 miles off course to the east.
>
> Nansen had faced a similar problem during his epic drift in the *Fram*. After the first eighteen months, it had become evident that the thirteen-man crew of the *Fram* were unlikely to come closer to the Pole than 300 miles unless they left the warmth and safety of the ship and set out on foot. [15]

Although it is often said that the Arctic Ocean and seafloor have been thoroughly explored, it should be borne in mind that this ocean is one and a half times the size of the USA. So the possibility of a small opening, or island with tunnel, having gone undiscovered cannot be absolutely ruled out. As far as the possibility of a 'coverup' is concerned, it is worth noting that according to some mystical and esoteric traditions, certain sacred areas of the earth are protected and concealed by the exercise of *occult* power (see part 4, section 2).

4. Flights of fancy

The south geographic pole was first reached on 14 December 1911 by the Norwegian explorer Roald Amundsen. On 17 January 1912 it was reached again, via a different route, by a British team led by Captain Scott, who was distressed to find Amundsen's flag already there. On their return journey, all five members of the team perished

during a blizzard.

Hollow-earthers have not been able to find many anomalies in Antarctica to explain in terms of a polar entrance to the earth's hollow interior. Some have argued that the southern opening is smaller than the northern one, or that it is completely blocked with ice. No modern hollow-earther argues that there is an opening centred on the south pole itself; the south pole is clearly a single point that can be reached by different routes, situated on a plateau with an elevation of 10,000 feet. Since 1956 there has been a permanently manned scientific base there.

In 1929 Richard E. Byrd became the first man to fly over the south pole; unlike his northern polar flight, this one aroused no major controversy! However, Byrd went on to lead several major expeditions to Antarctica, collecting valuable scientific information and flying over vast reaches of the continent, mapping its coast and mountain ranges. Some hollow-earthers have devoted a lot of time to distorting his findings and statements to support the idea of large polar openings.

In 1959 F. Amadeo Giannini published an extremely weird book entitled *Worlds Beyond the Poles*, in which he put forward his theory that the earth was linked to the moon and planets by a continuous land surface! He quoted a radio announcement supposedly made by Byrd from his arctic base in February 1947: 'I'd like to see that land beyond the Pole. That area beyond the Pole is the center of the great unknown' [1]. He claimed that on this northern polar flight, Byrd had flown 1700 miles 'beyond the earth' before returning to his base, and had passed over

> iceless land and lakes, and mountains where foliage was abundant. Moreover, a brief newspaper account of the flight held that a member of the admiral's crew had observed a monstrous greenish-hued animal moving through the underbrush of that land beyond the Pole. [2]

Giannini interpreted the 'land beyond the pole' to be celestial land connecting the earth with the moon and other planets!

His story about Byrd's 1947 flight was repeated in the December 1959 issue of *Flying Saucers* in a sensational article written by the editor, Ray Palmer, who used it to support the hollow-earth theory. Palmer claimed that Byrd must have flown part-way into the earth's hollow interior, and that this truth had been covered up. He also argued that flying saucers came from within the earth.

There was one small problem with the story about Byrd: in February 1947 he was officially in the *Antarctic*, not the Arctic! He was Officer in Charge of the huge US Navy Antarctic Expedition, Operation Highjump, involving 13 ships manned by 4000 men. According to his article on the expedition in *The National Geographic* (October 1947), Byrd arrived in Little America on 29 January 1947. On 15 February two planes, one of them piloted by Byrd, flew to the south pole, and then into the 'mystery land beyond the pole', as Byrd calls it. They flew about 100 miles to latitude 88°30'S, then turned eastward until they reached the 45th east meridian, when they turned back to Little America. Altogether they surveyed nearly 10,000 square miles of 'the country beyond the pole'. According to Byrd, all they saw there was a 'rolling white desert from horizon to horizon'. Byrd says that this flight from the base and back covered 1800 miles and

took 12 hours. They evacuated Little America on 23 February and arrived back in the US on 14 April.

Some of Ray Palmer's readers pointed out these facts to him, and in the February 1960 issue of *Flying Saucers* he said that in his opinion the flight in question was into the opening at the *south* pole, and that Giannini had falsified the north-pole flight. Giannini, however, stuck to his guns, and claimed that in 1947 Byrd had flown to the Arctic after leaving the Antarctic! He even claimed that the New York Office of US Naval Research had allowed him to transmit a radio message of godspeed to Admiral Byrd at his arctic base! Giannini asserted that Byrd's north-pole flight was reported by the *New York Times* and several other publications until censorship was imposed from Washington. Palmer says that his readers turned every library in the country upside down but found nothing to confirm the north-pole flight [3]. So either Giannini was a blatant liar or he suffered from a highly confused and unbalanced state of mind. Another serious problem with the supposed north-pole flight is that while February is summer in Antarctica, it is winter in the Arctic -- and perpetual darkness does not provide ideal conditions for a flight to the north pole, or for sighting 'a monstrous greenish-hued animal moving through the underbrush'!

In 1955/56 Byrd led another huge expedition to Antarctica, known as Operation Deepfreeze. In his book, Giannini quoted the following radio announcement: 'On January 13 [1956] members of the United States expedition accomplished a flight of 2,700 miles from the base at McMurdo Sound, which is 400 miles west of the South Pole, and penetrated a land extent of 2,300 miles beyond the pole' [4]. Byrd's account of the expedition in *The National Geographic* (August 1956) states that in 10 flights from the McMurdo Sound base, between 3 and 14 January, US Navy long-range planes observed approx. 800,000 square miles of Antarctica previously unseen by human eyes. On 8 January Byrd flew from McMurdo Sound over the 'area of inaccessibility' in the heart of East Antarctica, and then to the south pole. By the time he got back he had flown 2310 miles in just over 11 hours.

Palmer and other hollow-earthers assumed that Byrd flew 2300 miles beyond the south pole *in one direction*, and pointed out that this would be beyond Antarctica -- unless it had been into a polar opening! But it is clear that when Byrd speaks of 'the mysterious land beyond the pole', he simply means the unexplored part of the Antarctic continent, 'beyond' the south pole from the point of view of the US base on the Ross Ice Shelf.

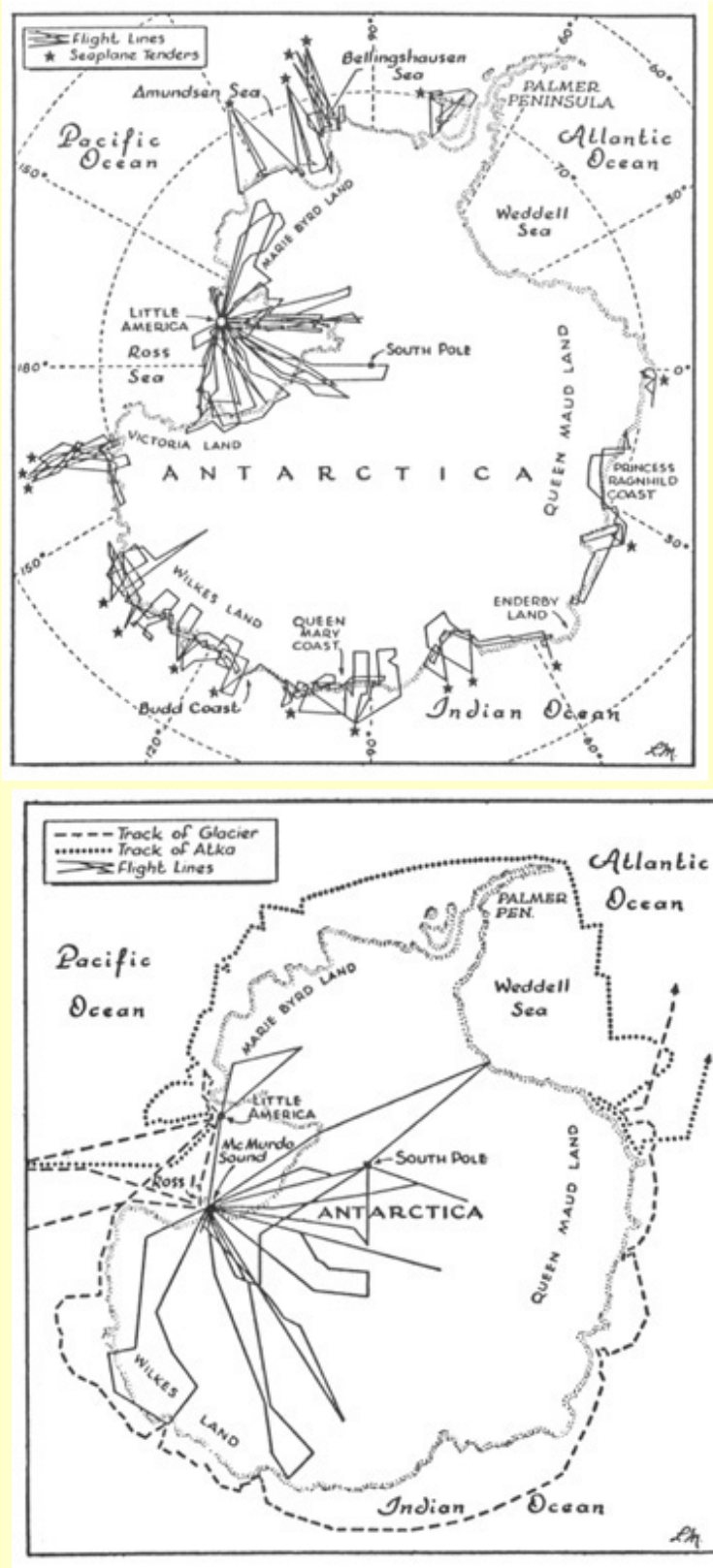


Figure. Flights made during the 1947 and 1956 expeditions to Antarctica [5].

The nonsense spread about Byrd's expeditions reached its climax in the publication of the 'secret' diary of his supposed 1947 flight beyond the north (!) pole [6]. It records how, as Byrd draws nearer to the pole, he passes over green valleys and sees an animal resembling a mammoth. Then suddenly three flying saucers marked with swastikas appear from nowhere and cause his plane to land by exercising a mysterious force. Byrd is escorted by two tall, blond, handsome men with German accents to a wise, aged man called the Master, who informs Byrd that he has passed

into the inner world of the Arianni. The Master tells him that surface humanity must cease tampering with atomic power or suffer a new Dark Age of destruction. 'Byrd' also records that on returning to the outer world, he was ordered by top security forces to remain silent. Remarkably, there are still a few hollow-earthers who take this piece of silliness seriously.

During the US Navy's 1947 exploration of Antarctica, a number of ice-free areas were found with fresh-water lakes amidst brown, barren rock hills [7]. The most remarkable of them, situated near the Queen Mary Coast of Wilkes Land in southeastern Antarctica, was entirely free of ice over at least 300 square miles -- Admiral Byrd called this 'the most surprising discovery of the expedition'. The lake contained countless billions of green, blue-green, red, and brown algae. The favoured explanation was that rock areas exposed by a retreating glacier or by prevailing winds would absorb a great deal of heat in the summer months of perpetual daylight, and this would slowly be reradiated. Subterranean heat sources were suspected in some cases. The German antarctic expedition to Queen Maud Land in 1938-39 also made some surprising discoveries, including a 'group of low-lying hills sprinkled with many lakes and completely free of ice and snow', resembling the barren hot springs region of Iceland [8]. However, none of this constitutes serious evidence for a southern polar opening.

Jan Lamprecht presents a couple of extremely tenuous arguments for openings at both the north and south poles [9]. He argues that long-delayed radio echoes might result from radio waves entering the earth's interior through a polar hole, bouncing around inside the earth, and then exiting again. And he suggests that the movement of air into and out of polar holes might explain certain meteorological phenomena, such as strange clouds sighted in Britain and America. He also refers to the fact that after the Chernobyl nuclear power plant accident in April 1986, scientists discovered a high concentration of radioactive fallout 38 km from the south pole, deposited in late 1987 or early 1988, some 20 months earlier. It is known that radioactive fallout from nuclear tests in the northern hemisphere takes 20 months to reach the south pole. However, Lamprecht says that this is the only spot in the southern hemisphere where Chernobyl fallout has been found, and believes that since the radioactive material was not detected crossing the equator, it must have travelled into the north-pole opening and out of the south-pole opening.

5. Auroras and the poles

The auroras seen in the polar regions are one of nature's most beautiful and mysterious phenomena. From space the aurora appears as a diffuse ring surrounding the polar regions, roughly centred on the geomagnetic pole. From the ground it can take the form of luminous arcs, bands, and patches, and at its most dramatic it appears as a shimmering, multicoloured curtain of light, rippling and swirling, everywhere broken up into spikes and streamers moving across the sky -- apparitions that the Vikings called 'the spears of Odin'. Auroras are generally aligned along the direction of the local magnetic field.

As William Corliss points out, even 'normal' auroras have not yielded up all their

mysteries:

> Auroras are loosely associated with solar activity and geomagnetic storms, so we surmise that gusts of electrically charged particles emitted by the sun (the solar wind) help in some way to set fire to the polar heavens. But beyond these generalities, there is much we do not understand. [1]

He adds that abnormal auroras, such as auroras near the earth's surface and auroras with curious geometries, 'reveal even deeper levels of ignorance about one of Nature's most spectacular manifestations'.

Figures. The aurora borealis [2].

The standard explanation is that auroral light is produced by a high-vacuum electrical discharge powered by the sun [3]. 98% of the charged particles (mainly electrons and protons) reaching the earth from the sun are deflected by the earth's magnetic field, while the rest manage to enter the comet-shaped magnetosphere -- though exactly where and how is unclear -- and are then stored in some unknown way. The particles that produce the auroras are believed to emanate from the plasma sheet inside the earth's magnetotail. They are accelerated to speeds near one-fifth that of light (200 times their original speed) -- again by some unknown mechanism -- and are steered by the magnetic field to the polar regions. Here they descend into the atmosphere and generate the aurora when they collide with and ionize oxygen and nitrogen atoms in the ionosphere, at heights from over 900 km to about 70 km. Because the ions are in an excited state, they emit radiation of various wavelengths, creating the characteristic colours of the aurora (yellow-green, blue, and red or purplish-red).

In *The Aurora Watcher's Handbook*, Neil Davis writes:

> Amazingly enough, auroral scientists still do not understand why aurora occurs in discrete auroral forms instead of as a diffuse glow across a broad region of the sky. The reason somehow has to be bound up in the way

matter in the plasma state behaves . . . [4]

Scientists believe that most of the universe is in the plasma state (the fourth state of matter), a plasma being an ionized gas, i.e. a gas in which at least some atoms have dissociated into positive ions and free electrons. The entire region from the centre of the sun to the bottom of the earth's ionosphere is said to be in the plasma state. Scientists acknowledge that they still have much to learn about plasmas. Indeed, theosophy implies that what is currently labelled 'plasma' sometimes includes higher states of matter.

Scientists have suggested mechanisms to explain auroral motions and shape changes. A major factor is believed to be the warping of the incoming particle streams by attendant magnetic and electric fields, but it is thought that additional mechanisms may be operating. The cause of the variation in the brightness of auroras and in the general level of activity over periods of several minutes is unknown.

The auroral breakup is the most active and spectacular part of a moderate to large auroral display. It is generally followed by a 'pulsating aurora', far weaker and less bright, consisting of patches of light blinking on and off in a regular pattern ranging from 0.1 sec to over 20 sec. This activity may continue for the rest of the night. Such pulsations sometimes overlie the stronger auroral activity too. The cause of these pulsations is unknown, but they are usually accompanied by geomagnetic pulsations.

Auroras in the northern hemisphere tend to be brighter than those in the southern hemisphere. Auroral displays in the two hemispheres are often mirror images of each other, but sometimes this conjugacy fails altogether, especially at higher latitudes. A startling finding is that pulsating auroras, on the other hand, are always exactly synchronous at opposite ends of the earth; they vary in brightness at exactly the same times within a fraction of a second, despite the fact that they are only quasi-periodic and have a strong random element. This points to a common, as yet unidentified cause, perhaps located in the equatorial plane, equidistant from the two poles.

Low-level (less than 60 km) and ground-level auroras are supposed to be impossible, as incoming particles should not have enough energy to penetrate that far into the atmosphere. However, there are very reliable reports of such phenomena. In addition to low-level auroras, evidence that terrestrial electricity may sometimes be discharged from the earth into the atmosphere during auroral displays includes the fact that some auroras tend to follow coastlines, the odours of ozone, sulphur, and/or 'electricity' detected in conjunction with low-level and high active auroras, and the surface electric effects associated with auroras [5]. Also anomalous is the fact that geomagnetic storms and auroras sometimes appear to correlate with thunderstorms, clouds, and atmospheric pressure [6]. Charged particles from the sun should not have enough energy to affect the weather, though some scientists think auroras somehow act as a trigger.

Another puzzling phenomenon is auroral sound -- swishing, rushing, crackling, and hissing sounds sometimes heard during auroral displays [7]. Current theory places auroral displays so high that the near-vacuum of the atmosphere should not transmit audible sound effectively. Moreover, several minutes should elapse between seeing the aurora and hearing sound, yet auroral sound tends to synchronize to some extent

with auroral motion, suggesting that conventional sound generation and transmission are out of the question, except perhaps in the case of genuine low-level auroras. Theories include direct perception of electromagnetic radiation from the aurora as sound, electrical discharge at the earth's surface induced by the aurora, and very-low-frequency waves generated by solar-wind particles acting on transducers such as hair.

Although auroras are more intensive during the highs of the 11-year solar cycle, not every solar flare triggers an aurora. It appears that while the sun feeds charged particles to the earth, the earth itself somehow controls the aurora. There is a certainly reason to doubt that the aurora is caused solely by charged particles from the sun. An alternative theory, proposed in the mid-20th century, is that the aurora is not caused primarily by solar particles but by electric currents originating in the earth which flow to the north and south magnetic polar regions and are then inducted to the atmosphere, where they ionize the gases in the higher, more rarefied layers of the atmosphere, producing the aurora. Finally, the electricity returns to the earth in lower latitudes, forming a continuous circulation of electricity through all parts of the crust and atmosphere. This theory readily allows for auroras to be produced in the lower atmosphere when atmospheric conditions allow [8].

Neil Davis explains that there is still some uncertainty as to how the auroral light is generated:

> Direct excitation by particle impact is a certainty, but some observations suggest that other processes may also be operating. These may involve heating by electric fields and interactions between ionized atmospheric constituents and various types of electromagnetic waves that pervade the medium. Questions still remain about all the processes that go into producing two of the aurora's brightest and most simple emissions, the oxygen red and green lines at 6300 A and 5577 A, and the cause of the 'enhanced aurora' remains a mystery. [9]

Auroral displays are sometimes accompanied by magnetic and electric disturbances, but not always. A possibility ignored today is that there are also subtler processes at work. Baron von Reichenbach in the 19th century and Wilhelm Reich in the 20th century argued that auroras partly result from the luminating properties of ethereal energy-substances pervading the atmosphere [10]. Reichenbach called this subtler substance odyle, and Reich called it orgone; both became convinced of its existence in the course of numerous experiments. Aurora-like glows can be produced in high-vacuum tubes that have been charged in an orgone accumulator and are simply stroked with the hand; no electrical excitation is involved here.

In 1716 Sir Edmund Halley (of Halley's Comet fame) suggested that some of the luminous atmosphere lighting the inner shells in the earth's hollow interior might be escaping through the much thinner crust at the poles, thereby producing the auroras. Lyon and Sherman believed that the earth's more highly developed interior world generated its own aural light, and that the auroras in the polar regions were largely caused by ethereal elements emanating from the interior world and emerging through polar openings [11].

Captain John Symmes, William Reed, and Marshall Gardner also invoked polar openings in their explanations of the auroras, but their views cannot be taken seriously: Symmes claimed that the auroras were caused by the sun's rays reflecting off the internal oceans; Reed argued that the aurora was due to the reflection on the clouds, ice, and snow of burning volcanoes and prairie or forest fires in the earth's interior; and Gardner argued that the aurora was caused by rays of light from the inner sun shining out of the large polar openings but being modified by clouds and other conditions of the inner and outer atmospheres. Jan Lamprecht speculates that charged particles from the outer sun are accelerated by circling repeatedly through the inner earth via polar openings some 200 miles across, and suggests that the electrons involved in pulsating auroras originate in the pulsating inner sun and are expelled through the polar holes.

According to theosophy [12], the aurora borealis and aurora australis are not merely electric and magnetic displays but are manifestations of the subtler psychomagnetic vitality of the earth. They are intimately linked with the sun, especially the sunspots, and are also connected with inrushes and outrushes of different types of monads or consciousness-centres both to and from our globe. Like earthquakes, the auroral discharges in one of their functions dissipate what would otherwise become an overaccumulation of magnetic and electric energy within the earth.

The magnetism reaching us from the sun -- physical, astral, and mental -- is said in theosophy to enter the earth in the region of the north pole. Part of it then passes directly from pole to pole through the centre of the earth, while other parts sweep over its surface from north to south, either meridionally or diagonally. At the south pole, some of it streams outwards into space and ultimately returns to the sun, while the rest returns to the north pole, either through the earth's interior or over its surface, and is then sent forth again. Clearly, known physical particles such as electrons and protons, along with photons (packets of electromagnetic energy), cannot pass through a solid earth. This would not apply, however, to neutrinos and more etheric energy-substances.

G. de Purucker says that the sun is both the heart and brain of its kingdom.

> If you look upon it as the heart for an instant, it receives the influxes of the rivers of lives, the circulations of the solar system, in its north pole. They pass through the heart of the sun, are cleansed and washed and leave at the south pole of the sun. Precisely as our earth and every other planet have each its receptor at the north pole, and its ejector or vent at the south pole.

He then refers to the Greek legend of Eolus and the cave of the winds, in which the cave stands for the earth, and the winds are the winds of the spirit, the circulations of the cosmos. The cave had two 'gates': the gate of horn in the north, through which the gods mainly descend but also ascend, and the gate of ivory at the south, out of which go the hordes of men.

> In other words, the earth feeds itself physically, magnetically, psychically, spiritually, through the north pole. The currents sweep through the earth -- every word here is worth a volume -- and leave by the south pole. So it is

with the sun. That is the way the sun feeds its family: just as the heart feeds the body. It sends out its blood through the south pole, as it were, and after the circulation around the body has taken place, it receives it in again at the north pole. [13]

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Mysteries of the Inner Earth: Part 4

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Mysteries of the Inner Earth

David Pratt

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1. The Imperishable Sacred Land

Theosophy teaches that a series of seven root-races or humanities will develop during the present fourth round of the earth's evolution. The first humanity is said to have appeared in the mid-Paleozoic, about 150 million years ago (according to the theosophical timescale), and we are currently in the fifth. Each lives on its own 'continent', a word referring not only to the main continental area where the evolution of a root-race takes place but also to *all the dry land* that exists during the life-period a particular root-race. Just as the root-races overlap, so parts of the continents of one root-race become incorporated into the continental system of the next [1].

The first continent is known as the Imperishable Sacred Land and is the most mysterious of the seven continents. It is said to be located in the region of the north pole.

> This 'Sacred Land' . . . is stated never to have shared the fate of the other continents; because it is the only one whose destiny it is to last from the beginning to the end of the Manvantara throughout each Round. It is the

> cradle of the first man and the dwelling of the last *divine* mortal, chosen as a *Shishta* for the future seed of humanity. Of this mysterious and sacred land very little can be said, except, perhaps, according to a poetical expression in one of the Commentaries, that the 'polestar has its watchful eye upon it, from the dawn to the close of the twilight of "a day" of the GREAT BREATH' [In India called 'The Day of Brahma.']. [2]

The statement that the first continent never sinks or perishes is repeated many times, and this characteristic distinguishes it from the other continents [3].

The first continent surrounded and included the north pole and extended somewhat southwards from the pole in seven different zones, like the leaves of a lotus. These zones included Greenland, Spitzbergen, Sweden, Norway, and Siberia, together with other former land areas in the far north that have since been submerged. The central locality of the first continent was right at the north pole. H.P. Blavatsky writes:

> If, then, the teaching is understood correctly, the first continent which came into existence capped over the whole North Pole like one unbroken crust, and remains so to this day, beyond that inland sea which seemed like an unreachable *mirage to the few* arctic travellers who perceived it. [4]

G. de Purucker drew attention to the phrase 'If, then, the teaching is understood correctly', and pointed out that Blavatsky was not permitted to give out all she had been taught [5].

If the earth is hollow, as Blavatsky's review of *The Hollow Globe* by Lyon and Sherman implies, then the first continent could refer to two different things: the polar land on the outer surface of the earth, and the sacred central land or 'inner circle' in the earth's interior, which will continue to exist until the earth reaches the end of its life-period. Likewise, terms such as 'the blessed land of eternal light and summer' and 'the land of the eternal sun'[6] could refer either to the polar land at a time when the earth's axis was more or less upright and the polar regions were in sunlight, or to the inner central land if the earth's interior is self-luminous or contains a central sun.

2. Shambhala

Tibetan sacred texts speak of a mystical kingdom called Shambhala, hidden behind snow peaks somewhere north of Tibet, where the most sacred Buddhist teachings – the Kalachakra or Wheel of Time – are preserved. It is prophesied that a future king of Shambhala will come with a great army to free the world from barbarism and tyranny, and will usher in a golden age. Similarly, the Hindu Puranas say that a future world redeemer – the kalki-avatara, the tenth and final manifestation of Vishnu – will come from Shambhala. Both the Hindu and Buddhist traditions say it contains a magnificent central palace radiating a powerful, diamondlike light.

The mythical paradise of Shambhala is known under many different names:

> It has been called the Forbidden Land, the Land of White Waters . . . , the

> Land of Radiant Spirits, the Land of Living Fire, the Land of the Living Gods and the Land of Wonders. Hindus have known it as Aryavarsha, the land from which the Vedas come; the Chinese as Hsi Tien, the Western Paradise of Hsi Wang Mu, the Royal Mother of the West; the Russian Old Believers, a nineteenth-century Christian sect, knew it as Belovodye and the Kirghiz people as Janaidar. But throughout Asia it is best known by its Sanskrit name, Shambhala, meaning 'the place of peace, of tranquillity,' or as Chang Shambhala, northern Shambhala, the name Hindus use to distinguish it from an Indian town of the same name. . . . [A]t the end of his life the Chinese Taoist teacher Lao-Tzu, returned to Shambhala, although he called it Tebu Land. . . .
>
> [I]t is regarded by most esoteric traditions as the true center of the planet, as the world's spiritual powerhouse and the heartland of a brotherhood of adepts from every race and country who have been influential in every major religion, every scientific advance and every social movement in history. [1]

Buddhist texts say that Shambhala can be reached only by a long and difficult journey across a wilderness of deserts and mountains, and warn that only those who are called and have the necessary spiritual preparation will be able to find it; others will find only blinding storms, empty mountains, or even death. One text says that the kingdom of Shambhala is round, but it is usually depicted as an eight-petalled lotus blossom – a symbol of the heart chakra. Indeed, an old Tibetan story states that 'The kingdom of Shambhala is in your own heart.' As Edwin Bernbaum points out, the guidebooks to Shambhala, whose puzzling directions are a mixture of realism and fantasy, can be read, on one level, as 'instructions for taking an inner journey from the familiar world of the surface consciousness through the wilds of the subconscious to the hidden sanctuary of the superconscious' [2].

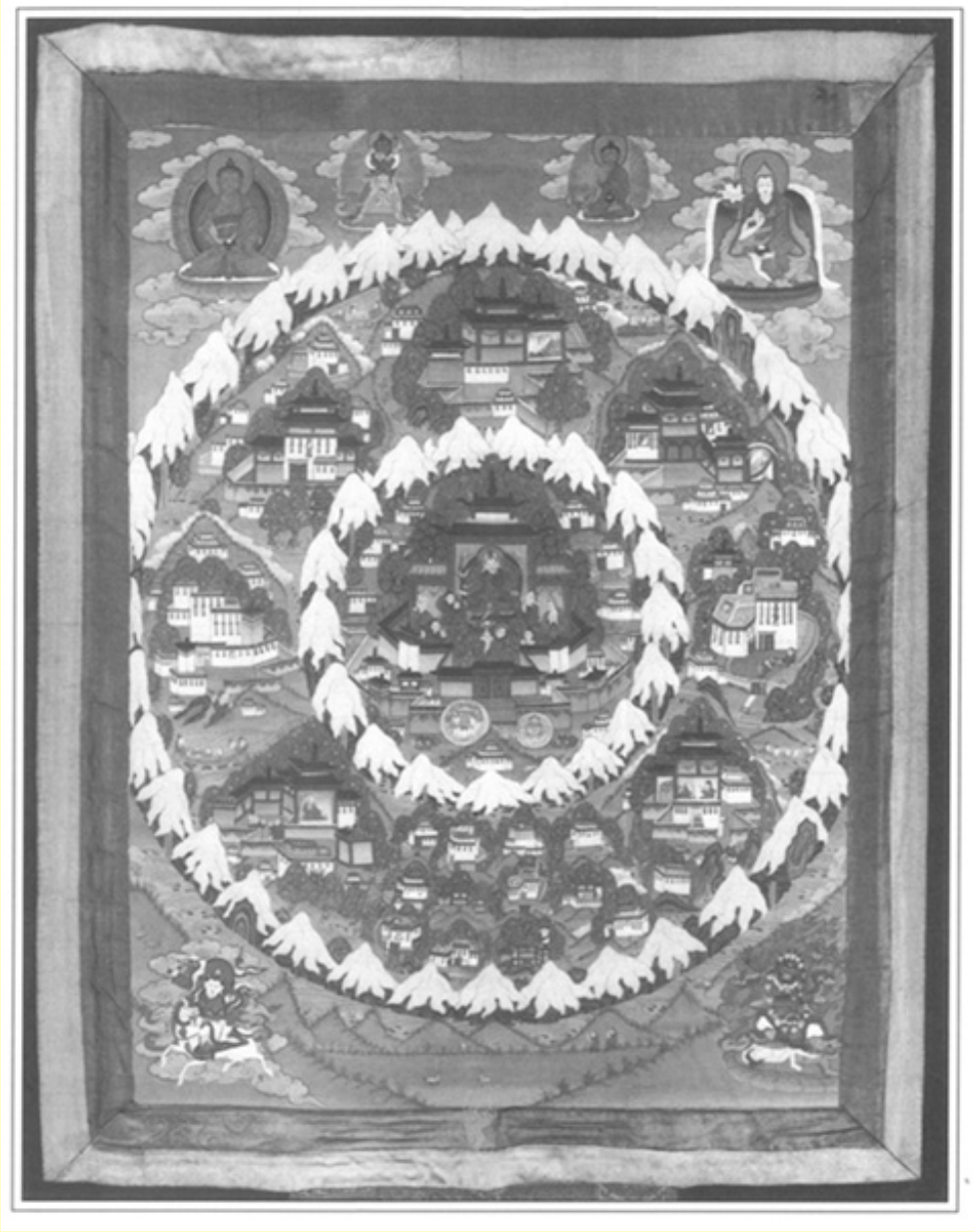

Figure. The Land of Shambhala. In the centre are Mount Meru and the King's palace, surrounded by 8 petal-shaped regions with their 96 principalities.

Nevertheless, the idea that Shambhala is also located in the material world is firmly rooted in Tibetan tradition. Opinions on where the kingdom might lie, however, differ markedly. Some Tibetans think it might be in Tibet, perhaps in the Kunlun mountains; more point toward the region around Mongolia and Sinkiang province of China; but most believe that Shambhala is in Siberia or some other part of Russia. Some lamas believe it is hidden in the desolate, uninhabited wastes of the Arctic. According to Lama Kunga Rimpoche, 'Shambhala is probably at the North Pole, since the North Pole is surrounded by ice, and Shambhala is surrounded by ice mountains.' Finally, a few lamas believe that Shambhala exists outside the earth on another planet or in another 'dimension' [3].

Bernbaum once had a dream of going with a guide to the north pole. As they approached the pole, the air became warmer and the snow cover thinner until there was only grassy tundra, flowers, and a balmy breeze. Finally they came to a round

pond with a small island that had a pole right at the centre. He turned to his guide and protested, 'But this is impossible! This can't be the north pole; there's supposed to be ice and snow up here.' The guide merely pointed at the island and said with a smile, 'There's the pole.' Bernbaum related his dream to Lama Chopgye Trichen Rimpoche, who remarked: 'That may have been the entrance to Shambhala' [4].

The Russian artist, philosopher, and explorer Nicholas Roerich (1874-1947) travelled through China and Mongolia to the borders of Tibet in 1925-1928. During a conversation with a lama, he was told: 'Great Shambhala is far beyond the ocean. It is the mighty heavenly domain. It has nothing to do with our Earth. . . . Only in some places, in the Far North, can you discern the resplendent rays of Shambhala.' When pressed by Roerich, the lama conceded that the heavenly Shambhala had an earthly counterpart. Indeed, the expression 'the resplendent rays of Shambhala' seems to be a reference to the aurora that manifests in the polar region. But the lama also described Shambhala as a 'far-off valley', hidden in the midst of high mountains, with hot springs and rich vegetation.

The lama stated that the ruler of Shambhala is 'ever vigilant in the cause of mankind': he sees all the events of earth in his 'magic mirror' and 'the might of his thought penetrates into far-off lands'. He continued: 'Uncountable are the inhabitants of Shambhala. Numerous are the splendid new forces and achievements which are being prepared there for humanity.' The lama confirmed that messengers from Shambhala are at work in the world, and that even the ruler himself sometimes appears in human form. He stressed that the secrets of Shambhala are well guarded, and that it is impossible for anybody to reach Shambhala unless their karma is ready and they are called [5].

The modern theosophical tradition, too, recognizes that Shambhala is a real place:

> Shambhala . . . , although no erudite Orientalist has yet succeeded in locating it geographically, is an actual land or district, the seat of the greatest brotherhood of spiritual adepts and their chiefs on earth today. From Shambhala at certain times in the history of the world, or more accurately of our own fifth root-race, come forth the messengers or envoys for spiritual and intellectual work among men.
>
> This Great Brotherhood has branches in various parts of the world, but Shambhala is the center or chief lodge. We may tentatively locate it in a little-known and remote district of the high tablelands of central Asia, more particularly in Tibet. [6]

> It is surrounded by an akashic veil of invisibility; and an army of airplanes might fly over it and see it not. All the armies of all the nations on earth might pass it by and not know that it existed. . . . It is quite an extensive tract of country. . . . [I]n it are gathered some of the most valuable records of the human race . . . There, surrounded by the greatest and most evolved human beings, the Silent Watcher of the Earth has his invisible abode. [7]

Shambhala, our 'spiritual home', is said in theosophy to comprise *two* localities on earth. One of them is 'situated in the highlands of Asia, somewhere to the westward of the meridian line passing through Lhassa' [8]. Long ago, this locality was a sacred

island in a vast Central Asian inland sea, known as the 'abyss of learning' or 'sea of knowledge', and was accessible via subterranean passages. According to tradition, this place exists to this day as an oasis surrounded by the Gobi desert [9].

But there is also another holy locality, alluded to in all the great exoteric religions:

> this spot is the summit of what in the Hindu Puranas is called Shveta-dvipa, Mount Meru or Sumeru. It is the north pole of the earth, so chosen not for its geographical qualities, if such there be, but on account of its astronomical position. . . . [I]t is the mystical north pole, geographically identical with the north pole of the earth, but mystically quite different . . . [10]

In other words, Shambhala, in one of its meanings, is the Sacred Imperishable Land. Theosophical literature also states that there is an even higher Shambhala located in the sun, and that all these different localities are inhabited by classes of entities with which the human race is spiritually and intellectually connected.

Bearing in mind that the Central Asian Shambhala is said to be protected by an 'akashic veil' which renders it invisible and impenetrable, it is interesting to note that in the review of *The Hollow Earth*, Blavatsky suggests that explorers may have been prevented from penetrating further north into what was then suspected to be an open polar sea by 'the exercise of some occult power'. This could be interpreted to mean that there is something in the northern polar region that is being concealed – not by a military/government conspiracy, but by occult forces.

3. A northern paradise

Traditions of a paradisiacal, primeval land in the far north are universal. Sometimes this sacred land is said to be located in the 'centre' or 'navel' of the earth. In one sense, this refers to the north pole, which appears to be in the 'centre' of the earth if the planet is viewed from above the pole. But clearly such expressions could also refer to the earth's interior. The northern paradise is often associated with a world tree, a world mountain or pillar from which four rivers emerge, and a world-engirdling serpent. The pillar, mountain, or tree links our own 'middle earth' with the upper and lower worlds [1]. All these symbolic features can be interpreted on different levels – terrestrial, astronomical, and spiritual.

Figure. The Scandinavian tree of life (Yggdrasil), growing on the cosmic mountain [2].

In Hindu mythology Meru* is the mystical mountain at the centre of the world, where Indra, king of the gods, has his jewelled palace. Victoria LePage points out that 'Mount Meru is conceived of as the earth's navel as well as its central staff, its source of life and power spreading out from the central region to the eight outer zones, and from thence to the world' [3]. The symbolism here is derived from embryology: just as the embryo grows from the navel outwards, so does the earth. 'Meru' actually has several different meanings, including a mountain in Asia, the north geographical pole, the north celestial pole, the earth's spin axis, the world axis connecting earth to higher realms, and the cerebrospinal axis of the human body.

*Like the Egyptians and the Akkadians, the Indians conceived of two opposed polar mounts: the arctic Meru, known as Sumeru (su = good, beautiful), was the dwelling of the gods, and the antarctic Meru, or Kumeru (ku = bad, miserable), was the dwelling of the demons.

Meru, the Olympus of the Indians, is said to be situated in the centre or navel of the earth. It was guarded by serpents, which 'watched the entrance to the realm of Secret Knowledge'. According to tradition, it was the 'land of bliss' of the earliest Vedic times. Occult teachings 'place it in the very centre of the North Pole, pointing it out as the site of the first continent on our earth, after the solidification of the globe' [4]. In the ancient astronomical text *Surya-Siddhanta* (12:34), Meru is described as 'passing through the middle of the earth-globe, and protruding on either side' [5]. H.P. Blavatsky says that 'Meru is *not* "the fabulous mountain *in* the navel or centre of the earth," but its roots and foundations are in that navel, though it is in the far north itself. This connects it with the "central" land "that never perishes" . . .' [6].

Just as the human body contains a series of chakras, or subtle energy centres, linked by the sushumna, a central channel in the spinal cord, so there may be corresponding energy centres on and in the body of the earth. Shambhala is sometimes described as the main power centre, with auxiliary centres scattered about the globe [7]. In theosophy, the heart of mother earth is said to beat 'under the foot of sacred Shambhala', and we are told:

> Occult teaching corroborates the popular tradition which asserts the existence of a fountain of life in the bowels of the earth and in the North Pole. It is the blood of the earth, the electro-magnetic current, which circulates through all the arteries; and which is said to be found stored in the 'navel' of the earth. [8]

This inner reservoir of physical and psychospiritual life-forces may correspond in one sense to the root-chakra (muladhara chakra) in the human body, situated at the base of the spine. From this viewpoint, Meru represents the central duct or path of terrestrial kundalini or shakti running through the earth [9].

Some Hebrew legends speak of a place called Luz – an underground city near a sacred mountain called the 'abode of immortality'. An almond tree, named *luz* in Hebrew, grew near it, a hollow in its roots leading down to the underground centre. René Guénon saw this as another version of the archetypal mountain/tree/cave complex symbolizing Shambhala. He stated that the real significance of Luz is that it corresponds in planetary terms to the muladhara chakra, whose kabalistic name in Hebrew is *luz*. The name derives from a root word denoting that which is concealed, secret, and silent; it also connotes a kernel – the innermost part of the almond. The most common iconographic depiction of Shambhala is similar to the four-spoked muladhara chakra, the subtle 'earth-centre' in the human body [10].

In his book *Paradise Found*, William Warren writes:

> [T]he earliest inhabitants of the Tigro-Euphrates basin located 'the Centre of the Earth,' *not in their own midst*, but in a far-off land, of sacred associations, where 'the holy house of god' is situated, – a land 'into the heart whereof man hath not penetrated;' a place underneath the 'overshadowing world-tree,' and beside the 'full waters.' No description could more perfectly identify the spot with the Arctic Pole of ancient Asiatic mythology. [11]

In *The Chaldean Account of Genesis*, we read: '[H]uman beings . . . the great gods created, and in the earth the gods created for them a dwelling. . . . [I]n the midst of the earth they grew up and became great, and increased in number, Seven kings, brothers of the same family . . .' Iranian, Indian, Chinese, Scandinavian, and Aztec literature also refer to this ambiguous location at 'the centre of the earth' [12].

The Japanese paradise was situated 'on the top of the globe' and at the same time 'at the centre of the earth'. It was called the 'island of the congealed drop'. Its first roof-pillar was the earth's axis, and over it was the pivot of the vault of heaven. Similarly, the Chinese terrestrial paradise, round in form, is described not only as at the centre of the earth, but also as directly under Shang-te's heavenly palace, which is declared to be in the polestar, and is sometimes called the 'palace of the centre'. The Egyptians located their Ta Neter, or land of the gods, in the extreme north [13]. Today there is an echo of these ancient traditions in the fact that children send notes to Santa Claus, or Father Christmas, in his 'wonderland' at the north pole, asking for gifts.

The Eskimos have legends that they came from a fertile land of perpetual sunshine in the north. They believe that after death the soul descends beneath the earth, first to

an abode rather like purgatory, but good souls then descend further to a place of perfect bliss where the sun never sets [14]. In Psalm 48:2 of the Bible, Mount Zion is said to be 'in the far north', and in Ezekiel (28:13-14) Eden, 'the garden of God', is placed on the 'holy mountain of God'. In Hebrew tradition, the primeval Eden is sometimes said to be at the 'centre of the earth' [15].

According to the Hindu Kurma Purana, an island called Shveta-Dvipa, or White Island, lay in the northern sea, the paradisiacal homeland of great yogis possessing supreme wisdom and learning [16]. Blavatsky writes: 'According to Tibetan tradition the White Island is the only locality which escapes the general fate of other dwipas and can be destroyed by neither fire nor water, for – it is the "eternal land" ' [17].

North of the Himalayas, possibly in the Tarim Basin, lay Uttarakuru or northern Kuru, a version of Shambhala which the Mahabharata describes as the blissful land of the sages towards which Arjuna, the warrior prince of the Bhagavad-Gita, travelled in search of enlightenment. It is described as a place of marvels where magic fruit trees yield the nectar of immortality. It is said to be one of four regions surrounding Mount Meru like the four petals of a lotus and to be the homeland of the siddhas, enlightened yogis famed for their miraculous powers [18].

Greek mythology speaks of a mysterious northern yet ever-springlike land called Hyperborea ('beyond the north wind'), situated beyond the mountains – in some accounts situated under the north pole – to which Apollo journeyed in his chariot of swans [19]. There the true 'omphalos' or navel of the earth was located. For the Orphics, the island of Electris, the seat of the gods, lies under the polestar in the furthest waters of Tethys [20]. The Mandean Gnostics believed that an ideal earth, an earth of light peopled by a divine race of superhumans, was situated in the north, separated from our world by a high mountain of ice. It is said to exist 'between heaven and earth', and Henry Corbin concludes that it does not refer to the north of our globe but to the 'cosmic north', i.e. superphysical realms [21]. But, like Shambhala, it might also have an earthly counterpart.

The Avestan term 'Airyanem Vaejah' (Pahlavi: Eran-Vej) designates the cradleland of the Aryan-Iranians, located not in any of the earth's seven climates, but at the centre of the central zone, the eighth climate [22]. It was there that Yima, the 'first man', received the command to construct a *vara*, or enclosure, where the most highly developed humans, animals, and plants would be gathered in order to save them from the deadly winter unleashed by the demonic powers so that they might one day refurbish a transfigured world. This *vara* or paradise had a gate and luminescent windows which secreted an inner light within, for it was illuminated by both uncreated and created lights. Its various meanings include a subterranean sanctuary, an ark, and the human body [23].

Airyanem Vaejah, the 'primeval land of bliss', appears to be identical to Shveta-Dvipa, Mount Meru, the Sacred Imperishable Land, and Shambhala (in its several meanings) [24]. Blavatsky quotes Fargard 1:2 of the Vendidad, where 'we find Ahura-Mazda saying to Spitama "the most benevolent" – that he made every land dear to its dwellers, since otherwise the "whole living world would have invaded the Airyana-Vaego" ' [25]. According to Fargard 2:40, 'The one thing missed there is the sight of

the stars, the moon, and the sun, and a year seems only as a day' [26].

4. Inner kingdoms

As with the idea of a paradisiacal cradleland of humanity at the north pole, references to networks of caverns and tunnels and/or an inner world within the earth are commonplace in the world's religions, myths, legends, and folklore. The attributes assigned to the underworld range from heavenly to hellish, and its inhabitants likewise range from superhuman to subhuman. Myths and legends generally embody multiple levels of meaning, and the underworld can also refer to nonphysical planes of reality.

During his travels in Asia, Nicholas Roerich spent a lot of time studying local folklore, which included tales of lost tribes or subterranean dwellers.

> In many places of Central Asia, they speak of the Agharti ['concealed', 'secret'], the subterranean people. In numerous beautiful legends they outline the same story of how the best people abandoned the treacherous earth and sought salvation in hidden countries where they acquired new forces and conquered powerful energies. [1]

While crossing the Karakorum pass, his Ladakhi guide said to him: 'Do you know that in the subterranean caves here many treasures are hidden and that in them lives a wonderful tribe which abhors the sins of the earth?'

> And again when we approached Khotan the hoofs of our horses sounded hollow as though we rode above caves or hollows. Our caravan people called our attention to this, saying, 'Do you hear what hollow subterranean passages we are crossing? Through these passages, people who are familiar with them can reach far-off countries.' When we saw entrances of caves, our caravaneers told us, 'Long ago people lived there; now they have gone inside; they have found a subterranean passage to the subterranean kingdom. Only rarely do some of them appear again on earth. . . .'
>
> Great is the belief in the Kingdom of the subterranean people. Through all Asia, through the space of all deserts, from the Pacific to the Urals, you can hear the same wondrous tale of the vanished holy people. And even far beyond the Ural Mountains, the echo of the same tale will reach you. [2]

There is rumoured to be a vast underground network of caves and tunnels under the whole of Central Asia, with many passages radiating out from the spiritual hub of Shambhala [3]. According to popular belief, there are numerous secret subterranean passages beneath India, whose entrances are guarded by elementals which assume the shape of rocks or other natural features. For instance, Varanasi (Benares), whose ancient name is Kashi, is said to be connected by a tunnel to Gupta Kashi ('gupta' = secret, hidden), an underground city in the Himalayas, about 50 miles from Badrinath [4].

Mesoamerica and South America have long been rumoured to be honeycombed with long, mysterious tunnels, some of them running for hundreds of miles, from Columbia in the north through Peru and Bolivia to Chile in the south, and to the Amazon jungle in the east. Only a few sections of these tunnels have so far been discovered [5]. H.P. Blavatsky mentions an immense tunnel running from Cuzco to Lima in Peru, and then extending south into Bolivia [6]. In Egypt, a vast subterranean world is traditionally believed to extend from the catacombs of Alexandria to Thebes' Valley of the Kings. The subterranean crypts of Thebes were known as the serpent's catacombs, the serpent being a symbol of wisdom and immortality [7].

Many Native American peoples believe that their ancestors originated in a joyous subterranean realm, or took refuge in caverns to escape past cataclysms. The Cherokee Indians speak of a subterranean world much like our own, with mountains, rivers, trees, and people [8]. The Aztecs said their ancestors came from a land called Aztlan, and that after escaping its destruction they ended up in a cavern called Chicomoztoc, or the Seven Cavern Cities of Gold, where they lived before emerging to the surface world [9]. The Mexican demi-god Votan describes a subterranean passage, a 'snake's hole', which runs underground and terminates at the root of the heavens; he himself was allowed to enter it because he was a 'son of the snakes' [10].

The Hopi Indians hold their rituals in an underground chamber known as the kiva.

> In the center of the kiva, on the altar level and directly below the roof opening, is the sunken fire pit in which a fire is lighted in the New Fire Ceremony . . . , for life began with fire. Next to it is the small hole in the floor called the *sipapuni*. Etymologically derived from the two words for 'navel' and 'path from,' the *sipapuni* thus denotes the umbilical cord leading from Mother Earth and symbolizes the path of man's Emergence from the previous underworld. . . . The ladder represents the reed up which man climbed during his Emergence . . . [11]

The Hopis believe there has been a succession of four worlds. The first world was destroyed by fire, the second by a poleshift, and the third by flooding. Some chosen people were saved from the disasters that destroyed the first two worlds by taking refuge underground, and some survived the destruction of the third world by being sealed inside hollow reeds. The Pima Indians speak of the emergence into our world being effected through a spiral hole that was bored up to the earth's surface [12].

Legends of ancestral origins in subterranean lands are also found in Africa and Australia. Australian aborigines believe their ancestors came up out of the ground, travelled about the country and created new tribes, then 'ultimately journeyed away beyond the confines of their territory, or went down into the ground again'. According to the native traditions of the Caroline Islands, Papua New Guinea, and Malaysia, a subterranean race of giants went underground in ancient times. Once inhabitants of the lost continent of Chamat, they will one day 'emerge and remake the world'. Natives of the Trobiand Islands believe that their ancestors emerged from a subterranean existence through a special hole. Tribes in Bengal and Burma also believe their ancestors emerged from a subterranean world [13].

In Hindu mythology there are many tales of the Nagas, a race of semi-divine serpent-people, who ruled a subterranean kingdom, Patala, filled with incredible wealth. Patala was said to be the lowest of the seven regions of the Indian underworld. These regions are collectively called Bila-svarga, the 'subterranean heaven', which is described as a place of great beauty. The sun and moon cannot be seen there, but the jewels decorating the hoods of the Nagas are said to emit an effulgence that illuminates the entire region of Bila-svarga. Few mortals were ever allowed to enter the lower world, but there were said to be many hidden entrances in the mountains of India and Kashmir [14]. In Tibet there is a major mystical shrine called Patala, which is said to lie above an ancient cavern and tunnel system, extending throughout the Asian continent and possibly beyond. The Nagas are related to the Rakshasas, an underworld race of 'demons', who possess a 'magical stone' or 'third eye' in the middle of the forehead.

In China, the Lung Wang (dragon kings) closely resemble the Nagas in many respects. They are said to dwell either in the 'celestial realm', i.e. the stars and planets, or beneath the surface of the earth. They, too, possess a 'magical pearl' in their foreheads, a mystical or divine eye or source of power. Like the Nagas, some of the entrances to their palaces or kingdoms can be found beneath lakes and rivers or behind waterfalls [15]. According to an ancient Chinese record, the Twelve Branches, all things began to germinate in the hidden recesses of the underworld. In the Ten Stems, it is said that at the ninth stem, light begins to nourish all things in the recesses below [16].

The Egyptian underworld or kingdom of the dead was called the Duat (or Tuat), ruled by Osiris [17]. Within the Duat were the Fields of Peace, which the Greeks equated with the Elysian Fields. In Old Kingdom times the Duat was commonly supposed to be situated somewhere under the earth. In this airless, waterless, and lightless place dwelt both the blessed and the damned. The kingdom of Osiris was also placed in the west, where the dead sun-god of the day passed at night. In addition, the Duat denoted the sky region dominated by the constellations of Orion, Taurus, and Leo, and divided by the 'winding waterway' or Milky Way.

The Duat is sometimes described as the 'reversed world' or 'inverted precinct' [18], and in the Pyramid Texts we read: 'O Osiris the King, I am Isis; I have come into the middle of this earth, into the place where you are' [19]. Osiris was the Egyptian phoenix, which was 'the bringer of the life-giving essence, the *hikê*, a concept akin to our idea of magic, which the great cosmic bird carried to Egypt from a distant and magical land beyond the earthly world.' This was the 'Isle of Fire', 'the place of everlasting light beyond the limits of the world, where the gods were born or revived and whence they were sent into the world'. This is a reference to the Duat [20].

The Duat, or Hidden Place, was sometimes conceived as a completely enclosed Circle of the Gods, formed by the body of Osiris. At the head-point there was an opening to the skies symbolized by the goddess Nut, through which the imperishable star (symbolized by the celestial disk) could be reached (see below) [21].

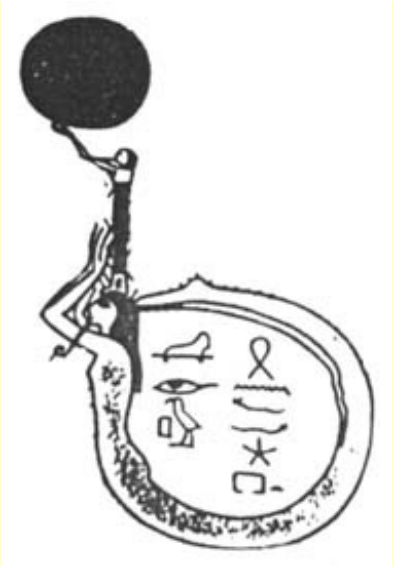

Figure. The Duat.

The Egyptian god Aker was the 'chief of the gate of the Abyss', of Aker, which was the netherworld but also the 'realm of the sun' [22].

The Celtic Otherworld was variously known as the Land of the Dead, the Land of the Living, the Land of Many Colours, the Promised Land, the Delightful Plain, the Land of Youth, the Land of Summer, and the Land under the Wave. In most of the stories, it was viewed as a pleasant land located somewhere beneath the sea, but in others it was to be found beneath the hills or entered via ancient burial mounds [23]. As in other traditions, the Celtic underworld is associated with cauldrons. In the Mabinogion, the land of Annwn ('unplumbed' or 'bottomless'), the Welsh underworld, contains a mystical cauldron which can restore the dead to life once more if they are submerged in it and brought out again [24].

In the *Critias* (120), Plato says that the 'holy habitation of Zeus' is situated 'in the centre of the world' [25]. In *The Republic* (part 4), he says that Apollo, the traditional interpreter of religious matters, delivers his interpretation 'from his seat at the earth's centre' [26]. He also writes:

> Apollo's real home is among the Hyperboreans, in a land of perpetual life, where mythology tells us two doves flying from the two opposite ends of the world met in this fair region, the home of Apollo. Indeed, according to Hecataeus, Leto, the mother of Apollo, was born on an island in the Arctic Ocean far beyond the North Wind. [27]

In the *Phaedo* Plato speaks of many cavities and 'wonderful regions' in the earth, and of subterranean flows of water, mud, and fire.

> One of the cavities in the earth is not only larger than the rest, but pierces right through from one side to the other. It is of this that Homer speaks when he says 'Far, far away, where lies earth's deepest chasm'; while elsewhere both he and many other poets refer to it as Tartarus. [28]

In the Greek view, the lands of the living were divided from Tartarus, the land of the

dead, by fierce obstacles, rivers, and bodies of water or fire. The greatest of these was Oceanus, which not only comprised all the seas of the world, but was also the largest of the 'rivers' which the Greeks believed swept into and through Tartarus, to emerge from the underworld on the opposite side of the earth. Other subterranean torrents included Lethe, the river of forgetfulness, and the Styx, the river of death. Tartarus was said to 'sink twice as far below the earth as the earth was beneath the sky', and to be bounded by many perils. As well as being the home of the dethroned gods called the Titans, it contained a variety of regions or kingdoms, ranging from the Elysian Fields to the many grottoes, caverns, and pits of torment reserved for the damned [29].

The 1st-century Roman philosopher Seneca spoke of people who 'forced their way into the caverns' and entered the bowels of the earth, 'penetrating to the deepest hiding places', where they saw 'great rushing rivers, and vast still lakes', a world where 'the whole of nature was reversed. The land hung above their heads, while winds whistled hollowly in the shadows, while in the depths, frightful rivers led nowhere into perpetual and alien night' [30]. He also wrote: 'A time will come in later years when the Ocean will unloosen the bands of things, when the immeasurable earth will lie open, and Thule will no longer be the extreme point among the lands' [31]. Clearly nothing on the earth's surface could lie further north than Ultima Thule (the Land of the Ultimate North).

The Scandinavian and Germanic peoples envisioned the world as an immense yew or ash tree, the limbs and roots of which spread into a variety of realms or planes of existence. The World Tree, Yggdrasil, plunged its deep roots into several subterranean kingdoms, which all bordered a vast primordial void called Ginnungagap. One root of Yggdrasil led into Niflheim, the land of the dead. As in the Greek underworld, many waters flowed out from the depths and into the human world; in Niflheim it was the spring/river Hvergelmir (meaning 'roaring cauldron'), which boiled and churned relentlessly. The 11 tributaries of the Hvergelmir emptied into the central void of Ginnungagap. The second of Yggdrasil's roots found its way into the lands of the gods, Asgard and Vanaheim. While often pictured as a land high in Yggdrasil's branches, this realm was a subterranean one as well. In fact, the only world of Norse cosmology that is not in some sense subterranean is that of Midgard (middle earth), the surface world. Bifrost, the 'rainbow bridge', stretched from Midgard across Ginnungagap into Asgard [32].

In the Elder Edda, Odin says: 'No one has ever known or will ever know the vastness of the roots of that ancient tree.' This is a reference not only to the created world and heavens, but also to the root-like cavern system beneath the surface world. Also issuing from the depths of the World Tree was the titanic world-serpent or ouroboros which encircled the earth and held its tail in its teeth. It was called 'the girdle of the world', and its writhings beneath the sea were one of the sources of storms and earthquakes. The main entrance to the subterranean realms lay in the north. Similarly, the Greeks believed that one of the entrances to Tartarus lay beyond Hyperborea, and the entrance to the Finnish underworld lay north of Lapland, where the earth and sky met.

In the Sumerian epic of Gilgamesh, the underworld or 'Great Below' was a place of immense size and great terror, filled with a wide range of beings, including spirits, the

undead, humanoids, and savage guardians. In his search for everlasting life, Gilgamesh first had to reach the mountain of Mashu, connected with the heavens above and the netherworld below. Having been allowed to enter the 'gate', he descended into the bowels of the earth through 12 double-hours of darkness before reaching 'an enclosure as of the gods', filled with brilliance, where there was a garden made entirely of precious stones [33]. According to Diodorus Siculus, the Chaldees, imagined the earth to have the form of a round boat turned upside down and to be hollow underneath [34].

The Bible describes the underworld or hell as a 'bottomless pit' (Revelation 9:1-2) and 'the abyss' (Romans 10:7), a place of punishment and misery, the abode of Satan and his demons. Other references to subterranean realms and life include the following:

> . . . at the name of Jesus every knee should bow, in heaven and on earth and under the earth . . . (Philippians 2:10, Revised Standard Version)
>
> And no one in heaven or on earth or under the earth was able to open the scroll or look into it . . . (Revelation 5:3)
>
> In saying, 'He [Christ] ascended,' what does it mean but that he had also descended into the lower parts of the earth? (Ephesians 4:9)
>
> For as Jonah was three days and three nights in the belly of the whale, so will the son of man be three days and three nights in the heart of the earth. (Matthew 12:40)

Jesus refers to this place as 'Eden' or paradise. Some hollow-earthers have read into the following quotation a reference to the alleged polar hole in the Arctic:

> He stretches out the north over the void, and hangs the earth upon nothing. (Job 26:7)

In the apocryphal Book of Enoch [35], Enoch speaks of proceeding to 'the middle of the earth', where he beheld a 'blessed land', 'happy and fertile' (25:1, 26:1). An angel shows him 'the first and last secrets in heaven above, and in the depths of the earth: In the extremities of heaven, and in the foundations of it, and in the receptacle of the winds' (59:2-3). There are said to be cavities in the earth and 'mighty waters' under it (65:1, 87:5, 95:2). Enoch sees an abyss 'opened in the midst of the earth, which was full of fire' (89:34); the abyss is said to be 'on the right side of the earth', which, according to Blavatsky, can mean in the north [36]. There is also a reference to seven great rivers, four of which 'take their course in the cavity of the north' (76:6-7).

Finally, the following passage from *The Secret Doctrine* contains several enigmatic statements referring to the far north and possibly to the inner earth. Speaking of the Kaf mountains of Persian legend, Blavatsky writes:

> Whatever they may be in their geographical status, whether they are the Caucasian or Central Asian mountains, it is far beyond these mountains to the North, that legend places the Daevas [giants] and Peris; the latter the

remote ancestors of the Parsis or Farsis. Oriental tradition is ever referring to an unknown glacial, gloomy sea, and to a dark region, within which, nevertheless, are situated *the Fortunate Islands*, wherein bubbles, from the beginning of life on earth, the *fountain of life*. But the legend asserts, moreover, that a portion of the first *dry* island (continent), having detached itself from the main body, has remained, since then, beyond the mountains of Koh-Kaf, 'the stony girdle that surrounds the world.' A journey of seven months' duration will bring him who is possessed of 'Sulayman's ring' to that 'fountain,' if he keeps on journeying North straight before him as the bird flies. Journeying therefore from Persia *straight north*, will bring one along the sixtieth degree of longitude, holding to the west, to Novaya Zemlya; and from the Caucasus to the eternal ice beyond the Arctic circle would land one between 60 and 45 degrees of longitude, or between Novaya Zemlya and Spitzbergen. This, of course, if one has the dodecapedian horse of [King] Hoshang or the winged Simurgh [a marvellous bird, the Persian phoenix] of Tahmurath (or Taimuraz) [third king of Persia], upon which to cross over the Arctic Ocean.*

*[The Caucasian bards] say that it requires seven months for a swift horse to reach the 'dry land' beyond Kaf, holding north without ever deviating from one's way.

Nevertheless, the wandering songsters of Persia and the Caucasus will maintain, to this day, that far beyond the snow-capped summits of Kap, or Caucasus, *there is a great continent now concealed from all*. That it is reached by those who can secure the services of the twelve-legged progeny of the crocodile and the female hippopotamus, whose legs become at will *twelve wings**; or by those who have the patience to wait for the good pleasure of *Simurgh-anke*, who promised that before she dies she will reveal the hidden continent to all, and make it once more visible and within easy reach, by means of a bridge, which the Ocean Daevas will build between that portion of the 'dry island' and its severed parts.** This relates, of course, to the seventh race, Simurgh being the Manvantaric cycle.

*Bailly thought he saw in this horse a twelve-oared ship. . . . But the 'horse' [has] a more occult primitive meaning. The crocodile and the hippopotamus . . . represented divine symbols . . . Poseidon is, in Homer, the God of the Horse, and assumes that form himself to please Ceres. Arion, their progeny, is one of the aspects of that 'horse,' which is a cycle.
**The severed parts must be Norway and other lands in the neighbourhood of the Arctic Circle.

It is very curious that Cosmas Indicopleustes, who lived in the sixth century A.D., should have always maintained that man was born, and dwelt at first in a country *beyond the Ocean*, a proof of which had been given him in India, by a learned Chaldean . . . He says: '*The lands we live in are surrounded by the ocean, but beyond that ocean there is another land which touches the walls of the sky; and it is in this land that man was created and lived in paradise. During the Deluge, Noah was carried in his ark into the land his posterity now inhabits.*' The twelve-legged horse of Hoshang was found on that continent named the *dry* island.

The 'Christian topography' of Cosmas Indicopleustes and its merits are well known; but here the good father repeats a universal tradition, now, moreover, corroborated by facts. Every arctic traveller suspects a continent

or a 'dry island' beyond the line of eternal ice. [37]

Yet no such island or continent in the far north has been discovered – on the earth's outer surface.

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